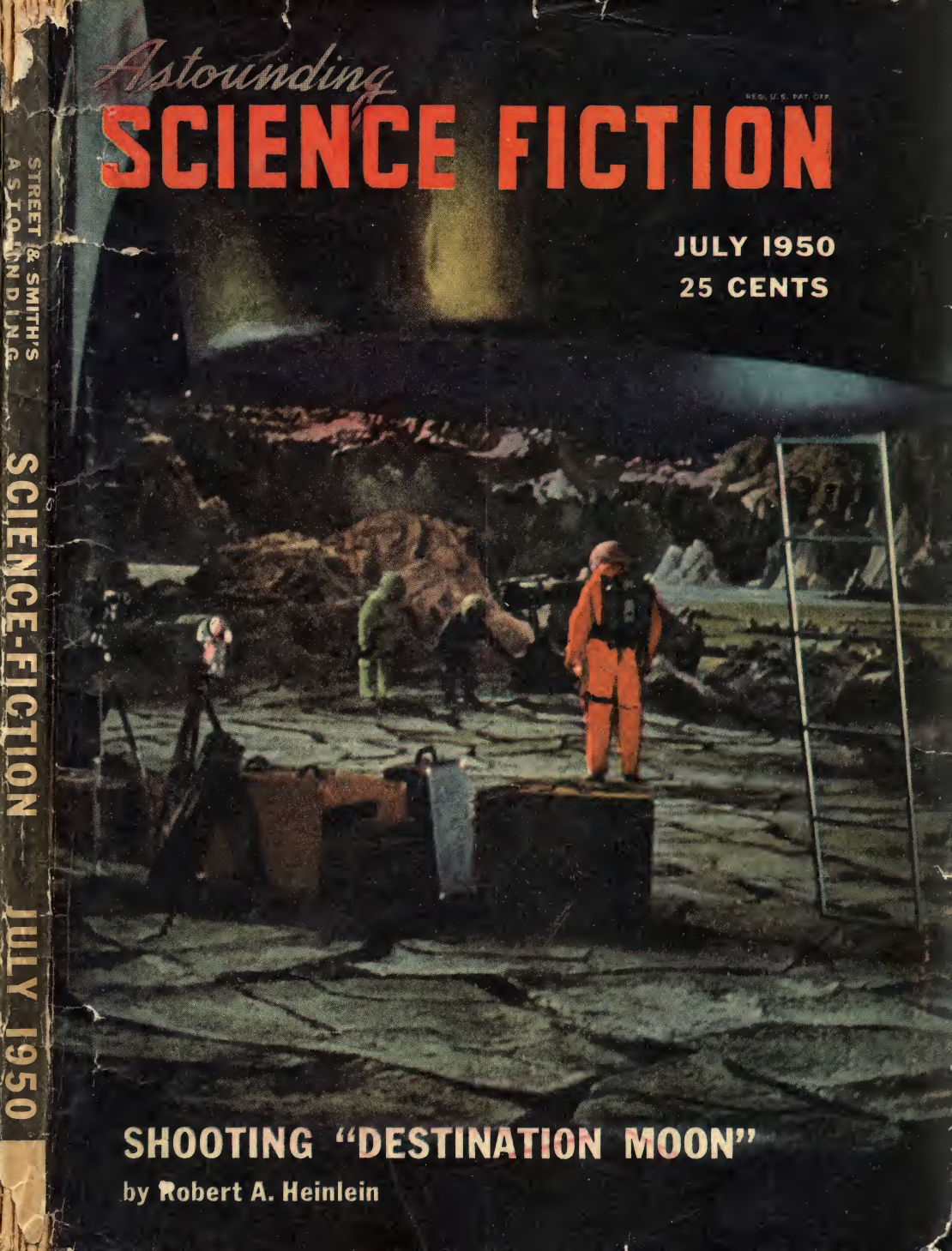
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SHOOTING "DESTINATION MOON"
by Robert A. Heinlein
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COVER: From The Pal Production: "Destination Moon"
Illustrations by Cortier and Miller

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INTELLECTUAL HOBSON—JOBSONISM

There's a phenomenon in linguistics which students of the field call "hobson-jobsonism." It's not, as might at first be supposed, named after two eminent doctors "Hobson" and "Jobson," but because of an incident in the British occupation of India.

The British troops who went into India did not understand Hindustani, and the British have long been known for their tendency to expect the other fellow to learn their language, rather than bothering with his. To the British troops, Hindustani was an unfamiliar collection of meaningless sounds—but they heard a lot of it around them. One phrase in particular was very common; the British troops found it sounded, to English-trained ears, like "hobson-jobson," and so referred to it. There's a natural human tendency to transpose the unfamiliar into familiar terms.

The British troops were by no means the first or the last to do so; it's a general human characteristic, indulged in by all peoples in all times. As a matter of fact, the word "barbarian" derives from the fact that the more civilized Greeks, scorning their less cultured neighbors, thought their language sounded like a vague repetition of the sound *bar-bar-bar-bar.*

Then there is the French terms for the bowsprit of a ship; it's called "beautiful meadow" in French. The English invented the gadget, and named it; the French sailing men found the English name sounded like the French words meaning "beautiful meadow"—and proceeded to install "beautiful meadows" on their own ships.

Now hobson-jobsonism is interesting but not very disturbing in the field of linguistics and phonetics; unfortunately the natural human tendency that results in linguistic hobson-jobsonism is a basic tendency in man—and it does cause trouble. It is the tendency to force the new and unfamiliar into the old and familiar form, however inappropriate that old form may be. The French were willing to call a bowsprit a "beautiful meadow," however outrageous the words, conceptually interpreted, were, because that fitted an old and familiar phonetic concept.

The trouble is, there is a very marked tendency in man to do precisely the same thing at the intellectual level—intellectual hobson-job-

sonism that leads a man to try to force, by main strength and intellectual awkwardness, a new concept into the handiest old and familiar pattern. The realm of nuclear physics, in particular, is apt to be rife with hobson-jobsonism; the electron-nucleus system is thought of like a miniature solar system although the idea is sheerest hobson-jobsonism. An electron in an atom is *not* a small, hard, charged particle; it does *not* rotate about the nucleus in an orbit in the sense that a planet circles a sun. It is closer to the truth to say that an electron *is* an orbit-shell. Here the mind is attempting to deal with a microcosmic phenomenon that has no possible remotely similar macrocosmic analogue.

This intellectual hobson-jobsonism is an item of very major importance to the world; it is one of the major stumbling blocks in the immeasurably important business of transferring knowledge from one human mind to another.

The first great block is language, of course.

Second, within any existent language there is the difficulty of definition of terms. A word does *not* mean what the speaker thinks it means, but what the *listener* thinks it means—so far as transferring the desired information is concerned. The man who is trying to get the information over must take that into account; it is useless for A to describe the material in his own terms; B will understand only in B's terms—and A has to realize that. The difficulty of that little job is slightly appalling in itself. Without going to the dictionary, make an offhand guess on the number of definitions you'll find for the common word "play," for instance and then check on the actual—and I assure you surprising!—number of meanings. When you use the word, are you sure it means—to your listener, of course—what you think it does?

Finally, when you have your words all properly defined and get mutual understanding of the concepts you are explaining—then your listener must fit those concepts into the pattern of what he already knows. And intellectual hobson-jobsonism steps in.

I have, recently, become most acutely aware of this latter phenomenon in connection with dianetics. I've tried to explain it to a good many people. Generally, the layman, once the word-values are mutually understood, can accept the new concepts rapidly and easily. He has no extensive previous familiar pattern on which to hobson-jobson the concepts. But the man who has previously worked in the field of the mind immediately hobson-jobson's the new ideas, however inappropriately, into his previous pattern of thought.

I have, for instance, explained dianetics to a hypnotherapist, who said, "Oh, yes—I understand. That's the type of work I've been doing. Hypnosis—that's what I've been using. I

(Continued on Page 106)

SHOOTING "DESTINATION MOON"*

BY ROBERT A. HEINLEIN

The problem of shooting a movie of a space flight is not simply one of getting a good story. Doing the job is a technical assignment darned near as tough as making the flight itself! And a good Hollywood technical prop engineer would make a first-class rocketship designer anyway!

"Why don't they make more science fiction movies?"

The answer to any question starting, "Why don't they—" is almost always, "Money."

I arrived in Hollywood with no knowledge of motion picture production or costs, no experience in writing screen plays, nothing but a yen to write the first Hollywood picture about the first trip to the Moon. Lou Schor, an agent who is also a science fiction enthusiast, introduced me to a screen writer, Alford van Ronkel; between us we turned out a screen play from one of my space travel stories.

So we were in business—

Uh, not quite. The greatest single production problem is to find someone willing to risk the money. People who have spare millions of dollars do not acquire them by playing angel to science fiction writers with wild ideas.

We were fortunate in meeting George Pal of George Pal Productions, who became infected with the same madness. So we had a producer—*now* we were in business.

Still not quite— Producers and financiers are not the same thing. It was nearly a year from the writing of the screen play until George Pal informed us that he had managed to convince an angel. (How? Hypnosis? Drugs? I'll never know. If I had a million dollars, I would sit on it and shoot the first six science fiction writers who came my way with screen plays.)

*"Destination Moon"—a George Pal Production in Technicolor, directed by Irving Pichel, released by Eagle-Lion.

Despite those huge Hollywood salaries, money is as hard to get in Hollywood as anywhere. The money men in Hollywood write large checks only when competition leaves them no alternative; they prefer to write small checks, or no checks at all. Even though past the big hurdle of getting the picture financed, money trouble remains with one throughout production; if a solution to a special-effects problem costs thirty thousand dollars but the budget says five thousand dollars, then you have got to think of an equally good five thousand dollars solution—and that's all there is to it.

I mention this because there came a steady stream of non-motion-picture folk who were under the impression that thousand-dollar-a-week salaries were waiting for them in a science fiction picture. The budget said, "No!"

The second biggest hurdle to producing an accurate and convincing science fiction picture is the "Hollywood" frame of mind—in this case, people in authority who either don't know or don't care about scientific correctness and plausibility. Ignorance can be coped with; when a man asks "What does a rocket have to *push* against, out there in space?" it is possible to explain. On the other hand, if his approach is, "Nobody has ever been to the Moon; the audiences won't know the difference," it is impossible to explain anything to him; he does not know and does not want to know.

We had plenty of both sorts of trouble.

That the picture did not end up as a piece of fantasy, having only a comic-book relation to real science fiction, can be attributed almost entirely to the integrity and good taste of Irving Pichel, the director. Mr. Pichel is not a scientist, but he is intelligent and honest. He believed what Mr. Bonestell and I told him and saw to it that what went on the screen was as accurate as budget and ingenuity would permit.

By the time the picture was being shot the entire company — actors, grips, cameramen, office people—became imbued with enthusiasm for producing a picture which would be scientifically acceptable as well as a box office success. Willy Ley's "Rockets and Space Travel" was read by dozens of people in the company. Bonestell and Ley's "Conquest of Space" was published about then and enjoyed a brisk sale among us. Waits between takes were filled by discussions of theory and future prospects of interplanetary travel.

As shooting progressed we began to be deluged with visitors of technical background — guided missiles men, astronomers, rocket engineers, aircraft engineers. The company, seeing that their work was being taken seriously by technical specialists, took pride in turning out an authentic job. There were no more remarks of "What difference does it make?"

Which brings us to the third

hurdle—the *technical* difficulties of filming a spaceship picture.

The best way to photograph space flight convincingly would be to raise a few hundred million dollars, get together a scientific and engineering staff of the caliber used to make the A-bomb, take over the facilities of General Electric, White Sands, and Douglas Aircraft, and *build* a spaceship.

Then go along and photograph what happens.

We had to use the second-best method—which meant that every shot, save for a few before take-off from Earth, had to involve special effects, trick photography, unheard-of lighting problems. All this is expensive and causes business managers to grow stomach ulcers. In the ordinary motion picture there may be a scene or two with special effects; this picture had to be *all* special effects, most of them never before tried.

If you have not yet seen the picture, I suggest that you do not read further until after you have seen it; in this case it is more fun to be fooled. Then, if you want to look for special effects, you can go back and see the picture again. (Adv.)

The Moon is airless, subject only to one-sixth gravity, bathed in undiluted sunlight, covered with black sky through which shine brilliant stars, undimmed by cloud or smog. It is a place of magnificent distances and towering mountains.

A sound stage is usually about thirty feet high, and perhaps a hundred and fifty feet long. Gravity is Earth normal. It is filled with cigarette smoke, arc light fog, and dust —not to mention more than a hundred technicians.

Problem: to photograph *in a sound stage* men making a rocket landing on the Moon, exploring its endless vistas, moving and jumping under its light gravity. Do this in Technicolor, which adds a sheaf of new problems, not the least of which is the effect of extra hot lights on men wearing spacesuits.

The quick answer is that it can't be done.

A second answer is to go on location, pick a likely stretch of desert, remove by hand all trace of vegetation, and shoot the "real" thing. Wait a minute; how about that black and star-studded sky? Fake it—use special effects. Sorry; once blue sky is on Technicolor emulsion it is there to stay. With black-and-white there are ways, but not with color.

So we are back on the sound stage and we *have* to shoot it there. Vacuum clear atmosphere? No smoking — hard to enforce —, high speed on all blowers, be resigned to throwing away some footage, and leave the big doors open—which lets in noise and ruins the sound track. Very well, we must dub in the sound —and up go the costs—but the air *must* be clear.

Low gravity and tremendous leaps—piano wire, of course—but did you ever try to wire a man who is

wearing a spacesuit? The wires have to get inside that suit at several points, producing the effect a nail has on a tire, i.e., a man wearing a pressurized suit cannot be suspended on wires. So inflation of suits must be replaced by padding, at least during wired shots. But a padded suit does not wrinkle the same way a pressurized suit does and the difference shows. Furthermore, the zippered openings for the wires can be seen. Still worse, if inflation is to be faked with padding, how are we to show them putting on their suits?

That sobbing in the background comes from the technical adviser—yours truly—who had hoped not only to have authentic pressure suits but had expected to be able to cool the actors under the lights by the expansion of gas from their air bottles. Now they must wear lamb's wool padding and will have no self-contained source of breathing air, a situation roughly equivalent to doing heavy work at noon in desert summer, in a fur coat while wearing a bucket over your head.

Actors are a hardy breed. They did it.

To get around the shortcomings of padded suits we worked in an "establishing scene" in which the suits were shown to be of two parts, an outer chafing suit and an inner pressure suit. This makes sense; deep-sea divers often use chafing suits over their pressure suits, particularly when working around coral. The relationship is that of an automobile tire carcass to the inner tube. The outer part takes the beating and the inner part holds the pressure. It is good engineering and we present this new wrinkle in spacesuits without apology. The first men actually to walk the rugged floor of the Moon and to climb its sharp peaks, will, if they are wise, use the same device.

So we padded for wire tricks and used air pressure at other times. Try to see when and where we switched. I could not tell—and I saw the scenes being shot.

Now for that lunar landscape which has to be compressed into a sound stage— I had selected the crater Aristarchus. Chesley Bonestell did not like Aristarchus; it did not have the shape he wanted, nor the height of crater wall, nor the distance to apparent horizon. Mr. Bonestell knows more about the surface appearance of the Moon than any other living man; he searched around and found one he liked—the crater Harpalus, in high northern latitude, facing the Earth. High latitude was necessary so that the Earth would appear down near the horizon where the camera could see it and still pick up some lunar landscape; northern latitude was preferred so that Earth would appear in the conventional and recognizable schoolroom-globe attitude.

Having selected it, Mr. Bonestell made a model of it on his dining room table, using beaver board, plasticine, tissue paper, paint, anything at hand. He then made a pin-

hole photograph from its center—Wait; let's list the stages:

1. A Mount Wilson observatory photograph.
2. Bonestell's tabletop model.
3. A pinhole panorama.
4. A large blowup.
5. A Bonestell oil painting, in his exact detail, about twenty feet long and two feet high, in perspective as seen from the exit of the rocket, one hundred fifteen feet above the lunar surface.
6. A blownup photograph, about three feet high, of this painting.
7. A scenic painting, about four feet high, based on this photograph and matching the Bonestell colors, but with the perspective geometrically changed to bring the observer down to the lunar floor.
8. A scenic backing, twenty feet high, to go all around a sound stage, based on the one above, but with the perspective distorted to allow for the fact that sound stages are oblong.
9. A floor for the sound stage, curved up to bring the foreground of the scene into correct perspective with the backing.
10. A second back drop of black velvet and "stars".

The result you see on the cover of this issue. It looks like a Bonestell painting because it *is* a Bonestell painting—in the same sense that a Michelangelo mural is still the work of the master even though a dozen of the master's pupils may have wielded the brushes.

Every item went through similar stages. I was amazed at the thoroughness of preliminary study made by the art department—Ernst Fegte and Jerry Pycha — before any item was built to be photographed. Take the control room of the spaceship. This compartment was shaped like the frustrum of a cone and was located near the nose of spaceship *Luna*. It contained four acceleration couches, instruments and controls of many sorts, an airplane pilot's seat with controls for landing on Earth, radar screens, portholes, and a hatch to the air lock—an incredibly crowded and complicated set. (To the motion picture business this was merely a "set", a place where actors would be photographed while speaking lines.)

To add to the complications the actors would sometimes read their lines while hanging upside down in midair in this set, or walking up one of its vertical walls. Add that the space was completely inclosed, about as small as an elevator cage, and had to contain a Technicolor sound camera housed in its huge soundproof box—called a "blimp", heaven knows why.

I made some rough sketches. Chesley Bonestell translated these into smooth drawings, adding in his own extensive knowledge of spaceships. The miniature shop made a model which was studied by the director, the art director, and the cameraman, who promptly tore it to bits. It wouldn't do at all; the action could not be photographed, could not

even be seen, save by an Arcturian Bug-Eyed Monster with eyes arranged around a spherical 360°.

So the miniature shop made another model, to suit photographic requirements.

So I tore that one apart. I swore that I wouldn't be found dead around a so-called spaceship control room arranged in any such fashion; what were we making? A comic strip?

So the miniature shop made a third model.

And a fourth.

Finally we all were satisfied. The result, as you see it on the screen, is a control room which might very well be used as a pattern for the ship which will actually make the trip some day, provided the ship is intended for a four-man crew. It is a proper piece of economical functional design, which could do what it is meant to do.

But it has the unique virtue that it can be photographed as a motion picture set.

A writer—a fiction writer, I mean; not a screen writer—is never bothered by such considerations. He can play a dramatic scene inside a barrel quite as well as in Grand Central Station. His mind's eye looks in any direction, at any distance, with no transition troubles and no jerkiness. He can explain anything which is not clear. But in motion pictures the camera has got to *see* what is going on and must see it in such a fashion that the audience is not even aware of the camera, or the illusion is lost. The camera must see all that it needs to see to achieve a single emotional effect from a single angle, without bobbing back and forth, or indulging in awkward, ill-timed cuts. This problem is always present in motion picture photography; it was simply exceptionally acute in the control room scenes. To solve it all was a real *tour de force;* the director of photography, Lionel Linden, aged several years before we got out of that electronic Iron Maiden.

In addition to arranging the interior for camera angles it was necessary to get the camera *to* the selected angles—in this inclosed space. To accomplish this, every panel in the control room was made removable—"wild," they call it—so that the camera could stick in its snout and so that lights could be rigged. Top and bottom and all its sides—it came apart like a piece of Meccano. This meant building of steel instead of the cheap beaver-board-and-wood frauds usually photographed in Hollywood. The control room was actually stronger and heavier than a real spaceship control room would be. Up went the costs again.

Even with the set entirely "wild" it took much, much longer to shift from one angle to another angle than it does on a normal movie set, as those panels had to be bolted and unbolted, heavy lights had to be rigged and unrigged—and the costs go sky high. You can figure overhead in a sound stage at about a thousand dollars an *hour,* so, when in the movie you see the pilot turn his head and speak to someone, then glance down

at his instruments, whereupon the camera also glances down to let you see what he is talking about, remember how much time and planning and money it took to let you glance at the instrument board. This will help to show why motion pictures theaters sell pop corn to break even —and why science fiction pictures are not made every day. Realism is confoundedly expensive.

Nor did the costs and the headaches with the control room stop there. As every reader of Astounding knows, when a rocket ship is not blasting, everything in it floats free—"free fall". Men float around—which meant piano wires inside that claustrophobic little closet. It was necessary at one point to show a man floating out from his acceleration couch and into the center of the room. Very well; unbolt a panel to let in the wires. Wups! while a spaceship in space has no "up" or "down," sound stage three on Las Palmas Avenue in Hollywood certainly does have; supporting wires must run vertically—see Isaac Newton. To float the man out of the tight little space he was in would require the wires to turn a corner. Now we needed a Hindu fakir capable of the Indian rope trick.

The special effects man, Lee Zavitz, has been doing impossible tricks for years. He turned the entire set, tons of steel, on its side and pulled the actor out in what would normally be a horizontal direction. Easy!

So easy that the art department had to design double gimbals capable of housing the entire set, engineer it, have it built of structural steel, have it assembled inside a sound stage since it was too big to go through the truck doors. Machinery had to be designed and installed to turn the unwieldy thing. Nothing like it had ever been seen in Hollywood, but it did enable a man to float out from a confined space and, later, to walk all around the sides of the control room with "magnetic" boots.

This double gimbals rig, three stories high, put the control room set high in the air, so the carpenters had to build platforms around it and the camera had to be mounted on a giant boom—one so huge, so fancy, and so expensive that Cecil B. de Mille came over to inspect it. The camera itself had to be mounted in gimbals before it was placed on the boom, so that it might turn with the set—or the other way, for some special effects. This meant removing its soundproof blimp, which meant dubbing the sound track.

("Who cares? It's only money." Don't say that in the presence of the business manager; he's not feeling well.)

This was not the end of the control room tricks. Some of the dodges were obvious, such as making dial needles go around, lights blink on and off, television and radar screens light up—obvious, but tedious and sometimes difficult. Producing the effect of a ship blasting off at six

gravities requires something more than sound track of a rocket blast, as the men each weigh over a thousand pounds during blast. Lee Zavitz and his crew built large inflated bladders into each acceleration couch. Whenever the jet was "fired" these bladders would be suddenly deflated and the actors would be "crushed" down into their cushions.

A thousand pounds weight compress the man as well as his mattress, which will show, of course, in his features. The make-up man fitted each actor with a thin membrane, glued to his face, to which a yoke could be rigged back of his neck. From the yoke a lever sequence reaching out of the scene permitted the man's features to be drawn back by the "terrible" acceleration. Part of what you see is acting by some fine actors, Dick Wesson, Warner Anderson, Tom Powers, John Archer; part was a Rube Goldberg trick.

The air suddenly escaping from the bladders produced a sound like that of a mournful cow, thus requiring more dubbing of sound track. The air had to be returned to the bladders with equal suddenness when the jet cut off, which required a compressed air system more complicated than that used by a service station.

The sets abounded in compressed air and hydraulic and electrical systems to make various gadgets work —to cycle the air lock doors, to rig out the exit ladder, to make the instrument board work—all designed by Zavitz. Lee Zavitz is the man who "burned Atlanta" in "Gone With The Wind," forty acres of real fire, hundreds of actors and not a man hurt. I saw him stumped just once in this film, through no fault of his. He was controlling an explosion following a rocket crash. It was being done full size, out on the Mojave Desert, and the camera angle stretched over miles of real desert. From a jeep back of the camera Zavitz was cuing the special effects by radio. In the middle of the explosions the radio decided to blow a tube—and the action stopped, ruining an afternoon's work. We had to come back and do it over the next day, after a sleepless night of rebuilding by the special effects crew. Such things are why making motion pictures produces stomach ulcers but not boredom.

The greatest single difficulty we encountered in trying to fake realistically the conditions of space flight was in producing the brilliant starry sky of empty space. In the first place nobody knows what stars look like out in space; it is not even known for sure whether twinkling takes place in the eye or in the atmosphere. There is plausible theory each way. In the second place the eye is incredibly more sensitive than is Technicolor film; the lights had to be brighter than stars to be picked up at all. In the third place, film, whether used at Palomar or in a Technicolor camera, reports a point light source as a circle of light, with

diameter dependent on intensity. On that score alone we were whipped as to complete realism; there is no way to avoid the peculiarities inherent in an artificial optical system.

We fiddled around with several dodges and finally settled on automobile headlight bulbs. They can be burned white, if you don't mind burning out a few bulbs; they come in various brightnesses; and they give as near a point source of light as the emulsions can record—more so, in fact. We used nearly two thousand of them, strung on seventy thousand feet of wire.

But we got a red halation around the white lights. This resulted from the fact that Technicolor uses three films for the three primary colors. Two of them are back to back at the focal plane, but the red-sensitive emulsion is a gnat's whisker away, by one emulsion thickness. It had me stumped, but not the head gaffer. He covered each light with a green gelatine screen, a "gel," and the red halation was gone, leaving a satisfactory white light.

The gels melted down oftener than the bulbs burned out; we had to replace them each day at lunch hour and at "wrap up."

There was another acute problem of lighting on the lunar set. As we all know, sunlight on the Moon is the harshest of plastic light, of great intensity and all from one direction. There is no blue sky overhead to diffuse the light and fill the shadows. We needed a sound-stage light which would be as intense as that sunlight—a single light.

No such light has ever been developed.

During the war, I had a research project which called for the duplication of sunlight; I can state authoritatively that sunlight has not yet been duplicated. An arc light, screened by Pyrex, is the closest thing to it yet known—but the movies already use arc lights in great numbers, and the largest arc light bulb, the "brute," is not nearly strong enough to light an entire sound stage with sunlight intensity—raw sunlight, beating down on the lunar set would have been equivalent to more than fifteen hundred horse power. There are no such arc lights.

We traced down several rumors of extremely intense lights. In each case we found either that the light was not sufficiently intense for an entire sound stage, or it was monochromatic—worse than useless for Technicolor.

We got around it by using great banks of brutes, all oriented the same way and screened to produce approximate parallelism. Even with the rafters loaded with the big lights almost past the safety point, it was necessary to use some cross lighting to fill gaps. The surface of the Moon had some degree of "fill" in the shadows by reflection from cliff walls and the ground; it is probable that we were forced to fill too much. We used the best that contemporary engineering provides—and next time will gladly use an atomic-powered

simulation of the Sun's atomic-powered light.

The simulation of raw sunlight was better in the scenes involving men in spacesuits outside the ship in space, as it was not necessary to illuminate an entire sound stage but only two or three human figures; a bank of brutes sufficed and no fill was needed, nor wanted, since there was no surrounding landscape to fill by reflection.

The effect was rather ghostly; the men were lighted as is the Moon in half phase, brilliantly on one side, totally unlighted and indistinguishable from the black sky itself on the other side.

This scene in which men are outside the ship in space involved another special effect—the use of a compressed oxygen bottle as a makeshift rocket motor to rescue a man who has floated free of the ship. The energy stored by compressing gas in a large steel bottle is quite sufficient for the purpose. I checked theory by experiment; opening the valve wide on such a charged bottle gave me a firm shove. The method is the same as that used to propel a toy boat with a CO_2 cartridge from a fizz water bottle—the basic rocket principle.

We had considered using a shotgun, since everyone is familiar with its kick, but we couldn't think of an excuse for taking a shotgun to the Moon. Then we considered using a Very pistol, which has a strong kick and which might well be taken to the Moon for signaling. But it did not *look* convincing and it involved great fire hazard in a sound stage. So we settled on the oxygen bottle, which looked impressive, would work, and would certainly be available in a spaceship.

However, since we were still on Las Palmas Avenue and not in space, it had to be a wire trick, with four men on wires, not to mention the oxygen bottle and several safety lines. That adds up to about thirty-six wires for the heavy objects and dozens of black threads for the safety lines—and all this spaghetti must not show. Each man had to have several "puppeteers" to handle him, by means of heavy welded pipe frames not unlike the cradles used by Tony Sarg for his marionettes, but strong enough for men, not dolls. These in turn had to be handled by block and tackle and overhead traveling cranes. Underneath all was a safety net just to reassure the actors and to keep Lee Zavitz from worrying; our safety factor on each rig was actually in excess of forty, as each wire had a breaking strength of eight hundred pounds. To top it off each man had to wear a cumbersome, welded iron, articulated harness under his spacesuit for attachment of wires. This was about as heavy and uncomfortable as medieval armor.

The setups seemed to take forever. Actors would have to be up in the air on wires for as long as two hours just to shoot a few seconds of film. For ease in handling, the "oxygen bottle" was built of balsa wood and imbedded in it was a small CO_2

bottle of the fire extinguisher type. This produced another headache, as, after a few seconds of use, it would begin to produce carbon dioxide "snow," which fell straight down and ruined the illusion.

But the wires were our real headache. One member of the special effects crew did nothing all day long but trot around with a thirty-foot pole with a paint-soaked sponge on the end, trying to kill high lights on the wires. Usually he was successful, but we would never know until we saw it on the screen in the daily rushes. When he was not successful, we had to go back and do the whole tedious job over again.

Most of creating the illusion of space travel lay not in such major efforts, but in constant attention to minor details. For example, the crew members are entering the air lock to go outside the ship in free fall. They are wearing "magnetic" boots, so we don't have to wire them at this point. Everything in the air lock is bolted down, so there is nothing to spoil the illusion of no up-and-down. Very well— "Quiet, everybody! Roll 'em!"

"Speed!" answers the sound man.

"Action!"

The actors go to the lockers in which their spacesuits are kept, open them—and the suits are hanging straight down, which puts us back on Las Palmas Avenue! "Hold it! Kill it! Where is Lee Zavitz?"

So the suits are hastily looped up with black thread into a satisfactory "floating" appearance, and we start over.

Such details are ordinarily the business of the script girl who can always be depended on to see to it that a burning cigarette laid down on Monday the third will be exactly the same length when it is picked up on Wednesday the nineteenth. But it is too much to expect a script girl to be a space flight expert. However, by the end of the picture, our script clerk, Cora Palmatier, could pick flaws in the most carefully constructed space yarn. In fact, everybody got into the act and many flaws were corrected not because I spotted them but through the alertness and helpfulness of others of the hundred-odd persons it takes to shoot a scene. Realism is compounded of minor details, most of them easy to handle if noticed. For example, we used a very simple dodge to simulate a Geiger counter—we used a real one.

A mass of background work went into the flight of the spaceship *Luna* which appears only indirectly on the screen. Save for the atomic-powered jet, a point which had to be assumed, the rest of the ship and its flight were planned as if the trip actually were to have been made. The mass ratio was correct for the assumed thrust and for what the ship was expected to do. The jet speed was consistent with the mass ratio. The trajectory times and distances were all carefully plotted, so that it was possible to refer to charts and tell just what angle the Earth or the Moon

would subtend to the camera at any given instant in the story. This was based on a precise orbit—calculated, not by me, but by your old friend, Dr. Robert S. Richardson of Mount Wilson and Palomar Mountain.

None of these calculations appears on the screen but the results do. The *Luna* took off from Lucerne Valley in California on June 20th at ten minutes to four, zone eight time, with a half Moon overhead and the Sun just below the eastern horizon. It blasted for three minutes and fifty seconds and cut off at an altitude of eight hundred seven miles, at escape speed in a forty-six-hour orbit. Few of these data are given the audience —but what the audience sees out the ports is consistent with the above. The time at which they pass the speed of sound, the time at which they burst up into sunlight, the Bonestell back drops of Los Angeles county and of the western part of the United States, all these things match up. Later, in the approach to the Moon, the same care was used.

Since despite all wishful thinking we are still back on Las Palmas Avenue, much of the effect of taking off from Earth, hurtling through space and landing on the Moon had to be done in miniature. George Pal was known for his "Puppetoons" before he started producing feature pictures; his staff is unquestionably the most skilled in the world in producing three-dimensional animation. John Abbott, director of animation, ate, slept, and dreamed the Moon for months to accomplish the few bits of animation necessary to fill the gaps in the live action. Abbott's work is successful only when it isn't noticed. I'll warrant that you won't notice it, save by logical deduction, i.e., since no one has been to the Moon as yet, the shots showing the approach for landing on the Moon *must* be animation—and they are. Again, in the early part of the picture you will see the *Luna* in Lucerne Valley of the Mojave Desert. You know that the ship is full size for you see men climbing around it, working on it, getting in the elevator of the Gantry crane and entering it —and it *is* full size; we trucked it in pieces to the desert and set it up there. Then you will see the Gantry crane pull away and the *Luna* blasts off for space.

That *can't* be full size; no one has ever done it.

Try to find the transition point. Even money says you pick a point either too late or too soon.

The *Luna* herself is one hundred fifty feet tall; the table top model of her and the miniature Gantry crane are watchmaker's dreams. The miniature floodlights mounted on the crane are the size of my little fingertip—and they work. Such animation is done by infinite patience and skill. Twenty-four separate planned and scaled setups are required for each second of animation on the screen. Five minutes of animation took longer to photograph than the eighty minutes of live action.

At one point it seemed that all

this planning and effort would come to nothing; the powers-that-be decided that the story was too cold and called in a musical comedy writer to liven it up with—*sssh!*—sex. For a time we had a version of the script which included dude ranches, cowboys, guitars and hillbilly songs on the Moon, a trio of female hepsters singing into a mike, interiors of cocktail lounges, and more of the like, combined with pseudoscientific gimmicks which would have puzzled even Flash Gordon.

It was never shot. That was the wildest detour on the road to the Moon; the fact that the *Luna* got back into orbit can be attributed to the calm insistence of Irving Pichel. But it gives one a chilling notion of what we may expect from time to time.

Somehow, the day came when the last scene had been shot and, despite Hollywood detours, we had made a motion picture of the first trip to the Moon. Irving Pichel said. "Print it!" for the last time, and we adjourned to celebrate at a bar the producer had set up in one end of the stage. I tried to assess my personal account sheet—it had cost me eighteen months work, my peace of mind, and almost all of my remaining hair.

Nevertheless, when I saw the "rough cut" of the picture, it seemed to have been worth it.

THE END

IN TIMES TO COME

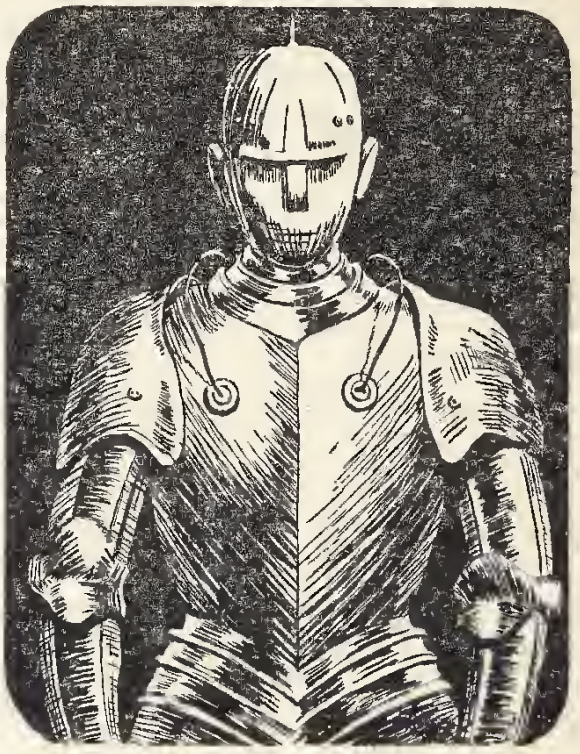
The August issue features H. Beam Piper's long novelette, "The Last Enemy"—and a fine yarn it is. The cover, based on that yarn, is by Miller. Miller has been turning out a series of excellent covers, and you'll be seeing more of his work right along. But Piper's yarn combines basic philosophy with a fast-stepping adventure-action story in a manner that seems to be rare, for few can do it, and fascinating when it's done. By the way, that "Last Enemy" is one we all know—and hasn't been conquered yet!

Bernard Kahn, missing for quite some time, is also back, with "A Pinch of Culture," which is based on the observed fact that frequently it isn't people who are crazy, but peoples!

The articles are also to be recommended. One has been mentioned before—J. J. Coupling's "How To Build a Thinking Machine," complete with circuit diagrams. It is *not* a computing machine doing arithmetic; it solves problems, and learns, and forgets; it has "pain" and "pleasure" impulses. Quite a gadget! The other article concerns language; the Hopi Indian language to be exact. The interesting point about it being that the Hopi language contains *no* concept of speed, velocity or acceleration—and has the principles of Einsteinian relativity implicit in its structure! You'll find it a strange approach to the problem of thinking-in-words—and a fascinating one.

THE EDITOR.

HEIR APPARENT



It was a good—and very dangerous!—question whether one man and his technical equipment could take over the rule of the System. If the answer was "Yes!" it was worse than dangerous!

BY LAWRENCE O'DONNELL

Illustrated by Miller

Harding stepped from the pier to the little submersible's deck and moved instantly into the shadow, black velvet on moon-white steel. He could hear nothing except water lapping softly, the distant thud and throb of machinery, and very far away, the hollow bellowing of riven air, either a jet plane passing over from Java, or a spaceship blasting off from one of the nearer islands. Phosphorescent waves rippled in the moon-track and the strong tropic stars regarded Earth dispassionately. On the deck there was no sound at all.

Harding glanced once at the white jagged dazzle that was Venus near the skyline. That diamond dot represented sixty-one thousand troubled human beings—if you could call them human—whose relations with the mother-planet had once been Edward Harding's responsibility. Or a

seventh of his responsibility.

He shook his head at the bright world in the sky. He would have to get over the habit of regarding the heavens as a chart with a glittering pinhead for each planet, and so many thousand Thresholders, ex-Earth-born, bred for the ecology of alien worlds, pinned up there upon the black velvet back drop for study and control. It wasn't his problem any more. Forget the Thresholders on Mars and the Secessionists of Ganymede and the whole tangled, insoluble mess that confronted the Integration Teams. Think about this current job, which was very simple now. Harding moved quietly toward the open companionway. Either the submersible wasn't guarded at all, or Harding was expected—

He was expected.

The big man in the tiny cabin below sat back in his chair and looked up to meet Harding's gaze squarely, the china-blue eyes watchful but calm. Billy Turner was a Buddha, solidly fat, solidly placid, the heavy face turned to Harding with an oddly innocent look of surprise.

"Something?" Turner asked mildly.

"You could call it that," Harding said. "Lay off, or I'll have to kill you, Turner."

The fat man waited a minute, his gaze holding Harding's. Then he took the pipe out of his mouth, squinted at it, clucked a little and struck an old-fashioned kitchen match on the edge of the table. He sucked the flame downward into the bowl and exhaled a cloud of pungent violet smoke that smelled of the Martian deserts in full sunlight.

"Seems like I don't quite place you," he said calmly to Harding. "We met before?"

"We didn't need to," Harding said. "Wait a minute." He stood perfectly motionless by the table, listening, his eyes going unfocused with the completeness of his concentration. It was a totality almost machinelike, both more and less than human. Then he grinned a tight, confident grin and pulled out a chair, sat down across the table from Turner.

Harding was a strongly built man with an incongruously academic look about him in spite of his stained and somewhat ragged clothing. He looked younger than his real years, and he looked ageless.

"No crew aboard," he said to Turner confidently. "Just the one Kanaka up forward. No guard. But you were expecting me, Turner."

Turner blew out a cloud of aromatic smoke from a tobacco that hadn't grown on Earth. His china-blue eyes were watchful and expectant.

"Today," Harding went on, "I was fired. Incompetence. I'm not incompetent to handle a radar fish-location unit. If I were, it wouldn't have taken the fishery a month to find it out. O.K. You assume I'll try for other jobs and lose them—through your interference. I'll end up combing beaches with a home-made Geiger counter, you figure. Then

you'll buy me for whatever dirty job you have in mind. It's your usual method, they tell me. It generally works. It won't work with me, because I'm one man in the Archipelagic who could figure out a foolproof way to kill you."

"Oh, you think so?" Turner asked, opening his blue eyes wide.

"You know what my job used to be," Harding said gently.

Turner blew out smoke, gazed thoughtfully at it.

"You were with an Integrator Team," he said.

Immediately, in the most curious way, Edward Harding's mind withdrew quietly into the middle of his head, pulling down blinds and closing doors as it went, receded along a lengthy corridor into the past that led by many closed episodes and half-forgotten things, until it came at the far end to a door. This was the door to a little square black-steel room called the Round Table. It was an entirely empty room, except for a tri-di screen, a chair and a table with a flat metal plate let into its surface.

Edward Harding in his mind's chamber sat down in the chair and put his palms flat on the plate. Instantly, as always, the tingling activation began. At first it was like wind under his hands, then water, then soft sand gently embedding his palms. He moved his fingers. Soundlessly his mind's image spoke. "Ready, boys. Come in."

Then in the chamber of memory the Composite Image moved slowly into being in the depths of the tri-di screen. Now the Round Table was open and the Integrator Team sat together at one table, no matter where the accident of their bodies placed them. Seven men made up the Team. Seven blended minds and bodies stood composite and whole in the screen of Harding's memory, as they stood perhaps at this very moment in the same screen, three thousand miles away before somebody else's watching face. Perhaps the Image spoke to somebody else as it had spoken to Edward Harding when he was . . . before he . . . well, in the old days. He wondered what the Image looked like now, with no Edward Harding in its make-up.

In the memory which Turner's careless words evoked, Edward Harding *was* in the make-up of the Composite Image. And as always, facing it anew, he looked for some trace of his own features in the blended synthesis of the seven Team-members. And as always, he failed.

Seven faces, seven minds—but you never could filter out the separate features of the men you knew so well. Always they blended into that one Image you knew even better than your own face in the mirror. The Round Table was open when you sat across the board from the Composite Image with the specialized knowledge of six other picked and long-trained Team-mates literally at your fingertips, each man sitting in a chair like your own, each idly molding the test-pattern under his palms.

Doctor, lawyer, merchant, chief—biochemist, physicist, radioastronomer—the needs of each Team met at the Round Table in the carefully chosen attributes of each member. And the needs could never have been fulfilled if all the men involved were actually in the same room, face to face. For knowledge had grown too complex. They talked a technical language made incomprehensible to one another by ultimate specialization. It took the Composite Image to integrate and co-ordinate the knowledge each member brought with the knowledge of each other member, and with the great Integrator itself.

But you could never find your own face in the Image, and you could never see the Image without your face blended into it. Harding thought of the Image as it had looked after George Mayall—left. By request. The first time the Team gathered at the Round Table with a new man in Mayall's place, how curiously flat and strange the intimate, composite features seemed with the new face incorporated. He had wondered then how Mayall felt, wherever he was, out in the cold, strange world after such a long time in the warm, intricately interlocking closeness of the Integration Team.

Well, Harding knew, now.

He thought as he had so often thought before, *What does it look like without me?* And he pictured the Composite Image cold and strange in the tri-di screen of the room no longer his, Doc Valley's face, and Joe Mall's, and the others, blending with the faces of strangers, linking with the minds of strangers, working on the old, complex, fascinating problems that weren't Edward Harding's any longer.

He slammed the door at the end of that long corridor of the mind, hauled his memory back past the shut doors and the closed episodes, and scowled into Turner's watching blue eyes.

"So let's get down to cases," Harding said harshly. "Make me an offer. I'm in a hurry. Six months from now, maybe you could pick me up off the beach and hire me for a bottle of gin. I won't wait. What are you driving at, Turner? Or would you rather I just killed you?"

Turner chuckled comfortably, his fat face quivering.

"Well, now," he said, "maybe we can arrange something. I'll tell you one thing that's been on my mind a while. I'm a busy man. I get around a lot. I got plenty of contacts. Been hearing about a fellow named George Mayall. You know him?"

Harding's hands closed on the table edge. His face went perfectly blank, like a clock's face, or a dynamo's. His eyes searched Turner's. Then he nodded.

"Mayall knows me," he said.

"I'll bet he does," Turner said, chuckling and quivering. "I'll just bet. Hates you like poison, doesn't he? He was on your Integrator Team and he got kicked off. *You* got him kicked off. Oh yes, Mayall

knows you, all right. Like to get his hands on you, wouldn't he?" The chuckles broke into a thick laugh that made Turner shake like a heavy and solid jelly.

"Very funny," Harding said coldly. "What of it?"

The jelly subsided slowly.

"Thought I'd hire you to pilot me out to Akassi," Turner said, watching Harding. "Trouble is, I don't think you're ready yet."

"I'm no pilot," Harding said impatiently. "I don't know these waters."

"Ah," Turner said in a wise voice, cocking his head, "but you know the Integrator. You could get me past the barriers around Akassi. Nobody else in the world could do that."

"Barriers?"

"Acoustic, visual, UHF, scrambler," Turner said in a comfortable voice, sucking his pipe. "Playing dumb, are you? Never heard of Akassi, eh?"

"What about it?"

"Quite a place these days," Turner said. "Strong defensive system all around it. As if you hadn't heard. Ha. Nobody goes in, nobody goes out. You and I could go in and come out with more loot than this submersible would carry—or we could stay and play god, with your talents and training. Except for one little thing—George Mayall. He might not like it."

Harding's eyes dwelt steadily on the fat, calm face. He did not speak.

"Didn't know Mayall was out here?" Turner asked. "Never even heard a rumor?"

"Rumors, sure," Harding said, and thumped the table with an impatient finger. "But not just where. Not this close. What are you getting at? What's Mayall up to?"

"In short, what's in it for you, eh?" Turner said. "Ah, that would be telling. Couldn't even guess, could you? What's likely to happen, when an Integrator man gets kicked off the Team?"

"He's given his choice of outside jobs, naturally," Harding said with some bitterness. "He doesn't stick with them." (How could a man stick with an outside job, once he had known the tight-knit interperceptivity of the Round Table? Membership in an Integrator Team is an experience which few men attain and none willingly forfeit. It is a tremendous psychic and emotional experience, the working out of a problem on the Round Table. Afterward, ordinary jobs are like watching two-dimensional, gray television when you've got used to full-color tri-di images—) "A man doesn't stick," Harding said. "He drifts. He winds up in a fishery in the Archipelagic and then a trader with a lot of influence gets him fired. And won't tell a straight story afterward. Come on, Turner, let's have it."

"Don't like getting kicked out when you're on the receiving end, eh?" Turner said. "What did they throw you out for, Harding?"

Harding felt his face grow hot. He set his teeth and held his breath,

trying to force the heat and the anger down. Turner watched him narrowly. After a moment he went on.

"Don't try to tell me," he said, "that it's bare coincidence brought you here, this close to Mayall. Don't say you haven't an idea what he's up to. You know more than I do, don't you, Harding?"

Harding struck the table hard.

"If you want something, say so!" he said. "If you don't, lay off and let me earn my living my own way. Coincidence? I haven't got any connection with Mayall any more. But I did once. We were picked for the same Team, and if you know what that means you won't think it's coincidence we drift the same way when we're free to drift. So we both wind up in the Archipelagic. What of it?"

"Mean to say you haven't been approached?" Turner asked keenly. "You've been out here this long and haven't heard a murmur from—anyone?"

"Murmur of what? Come to the point, Turner!"

Turner shook his head doubtfully. "Maybe they don't know about you. Maybe one Integrator man's all they needed. My good luck, anyhow. You mean the Secesh Thresholders haven't even tried to get to you?"

"Would I be here now if they had?" Harding asked reasonably. "Go on."

"Well, they got to Mayall. They set him up on Akassi with an islandfull of machinery and he's feeding them all they need in Integration to organize a withdrawal from the empire. Big stuff. Now maybe you see how I could use you, if you were ready to throw in with me."

"I see," Harding remarked coldly, "how *I* could get to Akassi and take over Mayall's work and cash in on the Secessionist deal for just about as much money as an Integrator could count. But I don't see where *you* come in, Turner."

"Oh, Mayall works through me," Turner said, puffing blandly. "I've got my network spread out from the Celebes to the Solomons. The Archipelagic States couldn't hide a secret from me if their lives depended on it. Mayall needs outside contacts, and I'm the contacts." He rolled ponderously in his chair.

"Thing is," he went on, "maybe I feel it isn't enough, just being contact man. Maybe I want a bigger cut. Maybe that's why Mayall put a roof over Akassi, just in case somebody like me got my kind of ideas. I couldn't do a thing about it—without you. You know how his mind works. You know what screens he'd dope out. But without somebody like me, Harding, you'd never even find Akassi."

"I wouldn't? Don't be too sure."

"If you could, you'd have done it before now. Maybe you haven't tried? Never mind. Mayall's no fool. He's dug himself a hole in the ocean and pulled Akassi in after him, if you want to look at it that way. The Secesh boys aren't paying him to set up an island the first stray radar

beam could pick out blindfolded. Those barriers around Akassi—well, they erase Akassi, that's all. You can't see it. You can't find it. It isn't there—unless you work with Mayall and know his code. Even then you can't pass the barriers unless Mayall invites you." He puffed violet smoke and squinted through it at Harding's face.

"You ready to risk your neck yet, my boy?" he asked. "It'll take the two of us. But Mayall hates you. He'll kill you on sight. That means a risk on your part. I'll buy you higher than the bottle of gin it'd cost next January. I'd cut you in for half the take—if you get me ashore at Akassi and help me work out my scheme to take over from Mayall."

"You'll have to have something pretty good to kick Mayall out a second time," Harding said thoughtfully.

"Well now, I expect I will," the fat man agreed. He took the pipe from his mouth and narrowed his eyes at Harding. "Surprised?" he asked. "You don't look it."

"If you expect perfectly normal human reactions from me," Harding said quite gently, laying his palms flat on the table with a soft, reminiscent gesture, "you're the one who's in for a surprise. A man doesn't work ten years on an Integrator Team and stay entirely human. A gradual occupational mutation sets in. For example—" He looked up and grinned suddenly.

"For example, I know we've been under weigh for about three minutes now. There's no perceptible vibration and no roll, so how could I have guessed?"

Turner grunted, but the blue eyes gleamed.

"You tell me."

"I *am* the boat," Harding said, and laughed. There was no amusement in the laughter. "I've got a score of my own to settle—with society. All right, Turner. I'm with you. Where's the control room?"

That was the question.

From Pluto to Mercury its echoes ran. From the New Lands mankind was molding into fertile red soil out of the stuff of fire and ice, on worlds where no man could have lived before technology brought the elements of life, from all the new colonies on the new planets that question went echoing endlessly. *Where is the control room?*

The artificial Threshold Experiments that mold humanity into shapes which can live on alien worlds had done their part. Thresholders inhabited the planets and the empire of Earth spun in a tight network around its sun. Interstellar drive was on the way. Paragravity was already a little more than theoretical. The enormous complexities of science sprang in century-long leaps across time. An engineering process would drag with it a dozen allied fields frantically trying to catch up, a biological method that could enable men to survive interstellar trips shoved rivals impatiently out of its all-important path, hustled other

sciences along with it.

The web from Earth had spun out, intricate and tangled, through the Solar System. Now it stretched tenuous threads toward the tremendous macrocosm of the stars, and the moment the first star was reached—Earth could fall.

It could fall as Rome fell, and for the same reason. The New Lands beyond the stratosphere grew, young and strong and integrated, but for century after century Earth had been the control room. The controls grew so complex that unification became an almost impossible task. Only by absolute unity, by a complete and bonded sense of solidarity, could the intricate socio-technological system of Earth stay below critical mass. And it couldn't stay there long.

For Earth had grown to be too small a planet. And the other planets were not ready yet to take up their burden. They brawled among themselves and they complained against Earth. They threatened secession. The isolationism of the New Lands became a menace that threatened the unity of the Solar Empire as Thresholders tugged angrily at the cords which bound them to the Earth from which they had sprung. And desperately in the meanwhile man strove for one major goal—sanity, rational thought, system, organization—integration.

This wasn't the best method, perhaps. But it was the best one they had.

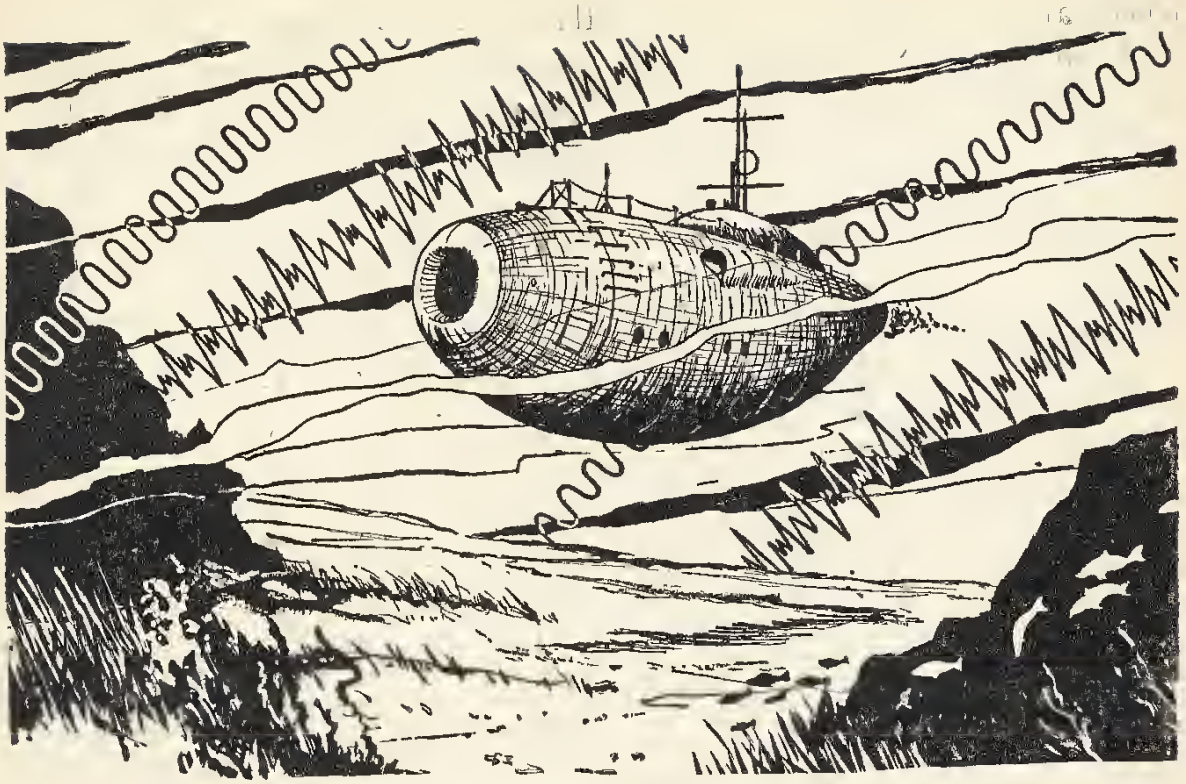
The Integrators were amazing things, electronic thinking-machines that could be operated efficiently only by teams of specially chosen, specially trained men who lived a specially planned life. When you lived a life like that, you were apt to mutate in unexpected ways. You didn't turn into a machine, exactly, of course. But the barrier between living, reacting man and nonliving, reacting machine broke down—a little.

Which is why Edward Harding could be the submersible boat he was guiding.

It didn't have isotopic mercury memory units, like a differential analyzer. It didn't trigger electrical circuits that punched out stored information and analytical reasoning for Harding to read. But in a way it nevertheless remembered—

And Harding's instantaneous reaction-time sense made him perhaps the one pilot alive who could have guided the submersible through the strong defenses Mayall had flung out around his island.

"We through yet?" Turner asked, up on deck. Around him the blue Pacific lay glittering emptily under a flawless sky. There was a faintly unpleasant smell in the air which the trades couldn't dispel. Turner puffed strongly at his pipe, studying the empty horizon that wasn't really empty. His eyes strained to find some break, as though the sky could tear like a veil, rift from top to bottom and let the real world show through. Mayall's world, Mayall's miraculously camouflaged island,



impossible to find in spite of its plain markings on the charts.

In the control room below deck, Harding sat perfectly relaxed in a cushioned chair, his arms slipped into elbow-length metal gauntlets that glistened like wet snakes. Before his eyes hung a transparent disk, shaded like a color wheel. Harding moved his head gently so that his gaze looked through this section and that of the special lens. Before him, vertical on the wall, was the cosmosphere, a great half-globe that ran and bled and fountained with shifting colors and patterns. Radar and sonar made up only part of the frequencies that were the living chart of the cosmosphere. It showed the heavens above, the waters around, the reefs below—and most of the time now, it lied.

Harding said, "We're not through yet. One more barrier—I think."

On deck, Turner puffed violet smoke at the bland blue sea.

"Afraid of Mayall?" he asked the microphone.

"Shut up a minute. Tricky here."

The false screen bled and flared, showing a clear, narrow passage through empty water. Harding moved his head around the varying shades of the lens, trying to find a frequency that checked accurately with another. Only this would keep the ship from sinking, this and the magnetic control planel.

Over the ordinary manual controls, a metal plate had been attached, corrugated and colored and marked into a pattern as dizzying as that which spun across the cosmos-

phere. But Harding knew it. He had used such controls with the Integrator. His gauntleted hands moved above the plate without touching it, while his glittering fingers played upon an invisible keyboard.

The varying magnetisms leaped a synapse from the ship across lines of force into the metal gauntlets, and Harding's own body-synapses snapped the messages instantly to his brain. His fingers responded as instantly on the keyless keyboard. And as his fingers moved, the ship moved, delicately, warily, perceptively, through wall after wall of frequency mirage where no ordinary compass or radar would operate sanely.

He was the ship.

"Afraid of Mayall?" he echoed Turner's question after a moment. "Maybe. I can't tell yet. I've got to find out something first. So it all depends."

"Find out something?" Turner sounded suspicious.

Harding cocked a sardonic eye at the round ear of the diaphragm. He said nothing. Presently Turner's voice came again. There was provocation in it.

"I've often wondered," he said, "why Mayall was kicked off the Team."

"Have you?" Harding asked in a noncommittal voice. He paused. After a while he said, "The important thing right now is that he blames me for it. So naturally, he hates me. He's afraid it could happen again. And it could. Oh yes, Mayall has the strongest reason in the world for hating me."

His tone grew thoughtful. "I'm a rival. I'm the heir apparent. And all he's got is Akassi. He'll be afraid of me. He'll try to kill me." Harding meditated upon this thought. "See anything up there?" he asked, after a moment.

"Nothing yet," Turner's voice came down thinly. "Sure he'll try to kill you. Wouldn't you, in his place?"

"I probably will anyhow. Try, I mean." Harding made the modification of his verb in a meticulous voice. "Akassi is—well, pretty tremendous. I hadn't actually realized it until now. These barriers are—slightly phenomenal." He considered, then laughed shortly. "The defenses must be so complex that only something like this could have a chance. A direct, unexpected, outrageously simple attack. We'll have to—"

"Harding!" the diaphragm broke in with a sudden rasp. "Look! I can see the island!"

"Can you?" Harding asked dryly. There was a pause.

"It's gone," Turner said.

"Sure. And if we'd turned that way we'd be gone, too. Rocks. Wait."

The glittering gauntlets performed arpeggios in the air. "I think," Harding said, watching the cosmosphere, "I think we're through."

"We are," the voice from above said, more quietly now. "I can see the island again. Different now. I can see buildings beyond the hills there. And a spaceship, ready to

take off. Take her in shore, Harding. Ground her on the beach. We've got a jet-stern, you know."

Harding had no idea what the beach looked like in a visual way, but the cosmosphere showed him all he needed to know of the strand he was approaching, the composition of the sand, what rocks lay under it, how far back the vegetation began. Under him the floor jolted upward as the ship's stern rose at a stiff slant, hesitated, grated motionless. A little shudder began in Harding's gauntleted hands and spread briefly through his body.

He took off the gauntlets.

He was no longer the ship.

He felt himself divide into two separate halves again, one flesh and blood, himself, the other mobile metal going inert as the life withdrew from it. For a rather horrible moment he wondered what it might be like someday if the machine he operated would not let him go. If the metal developed a taste for life, and the tool became the master.

"Harding?" Turner's voice called softly. "Come up. Better bring your gun."

Standing together at the rail, they scanned the peaceful, tree-fringed shore. Gentle green hills rolled upward inland a little way, and you could see rooftops over them, a high spider-web tower glittering against the sky, and farther back the unmistakable blunt, skyward pointing snout of a spaceship standing on its fins.

"It's quiet enough," Turner said, regarding a spider crab that scuttled across the sand, its eyestalks twiddling convulsively. "Have we sprung any traps yet?"

"No. I neutralized frequencies that would have tipped Mayall off. But I doubt if we can get to the settlement without announcing ourselves."

"We may. Two men might have a chance where a small army wouldn't. Where's the best place to . . . to ring his bell?"

"Under the circumstances," Harding told him, "it's straight ahead, inland, toward those hills. Plenty of brush for cover here. The cosmosphere can't show everything, and Mayall's no fool—but spectral analysis showed that brush has had nonlethal frequencies used on it. There are microphone pickups, too, so—"

"So our trick ought to work, eh?" Turner said solemnly, tapping out his pipe over the rail. "You call out your code phrase and Mayall will hear it. Don't see how we can miss. Only, don't go getting any funny notions, my friend. You and I haven't got a chance unless we stick together. I can't help remembering you and Mayall worked together for a good many years. I keep wondering how a man feels, once he's kicked off an Integration-Team."

Harding laid his hands on the hot rail and slid the palms back and forth slowly. Then he tightened his grip so that every vibration of the boat carried up through his nerves to his responsive brain.

"A man misses it," he said dryly. "Come on. We're wasting time."

The frequency caught them in the middle of the brush field. They had been only partially prepared for this. From now on everything would have to be played out free-hand, on the spur of the moment. Turner, who had been walking ahead, flung up a warning arm. Harding felt the beginning tremor a moment before Turner did, and with desperate speed he sucked air deep into his lungs and let it out again in a shout that must have made the hidden microphones planted along the shore rattle in their clamps.

"Mayall!" he roared. *"Mayall!"* And then he added a phrase that had no meaning to Turner, a quick, glib phrase which only an Integrator of Team Twelve-Wye-Lambda would know.

While he shouted, Harding let his muscles relax with a sort of frantic limpness, a lightning speed and control. Barely in time. The last syllables of his yell still hung in mid-air as he dropped into a crouch. The brush closed over his head and the vibration froze him motionless against the warm earth.

After that there was nothing but silence. The sky burned blue. The air hummed. His shouted words hung echoing in the stillness.

It seemed to Harding that he heard a sort of caught breath sough out of somewhere, hidden microphones catching the sound of it with a note of surprise. But Harding was almost instantly distracted by the urgent and immediate problem of Edward Harding, and the difficulty of staying alive.

First his eyes began to sting, because he couldn't blink. Almost immediately thereafter a frightening sensation of darkness and dizziness swept up from the brown earth and down from the clear blue sky, a shadow enfolding him from without which seemed to come hollowly and emptily from within at the same time.

He had stopped breathing.

That wasn't the worst, of course. The autonomous nervous system controls the heart, too. He hadn't anticipated this. The cosmoscope had revealed only nonlethal frequencies in this barrier field. Somehow it hadn't occurred to him that "nonlethal" is a comparative term. He felt his heart lurch heavily in his chest, aware of its nonmotion as he had never been fully aware of its beating. Doggedly for a long instant, while that caught breath of surprise from some hidden throat echoed in the microphones, and the shadow of darkness hovered, he crouched helpless under this paralyzing power.

Then out of a dozen separate little mouths, vibrating tinnily low down in the brush, a harsh, familiar voice called out.

"Harding?" it cried incredulously. "Harding, is it you? *Here?* Welcome to Akassi, Harding!" Sardonic menace sounded in the voice. It paused briefly and then rattled off a series of signal numbers that meant

nothing to Harding. "I'm cutting the paralysis," Mayall's harsh voice said exultantly. "I don't want you to die —that fast."

Blood roared in Harding's ears. A sense of wide-opening distances lifted dizzily around him as the frequency-lock let go. The shadows from without and from within drew back, rose beyond the sky, sank deep into the earth, closed up like a black flower's petals and became a seed inside Harding again. Briefly and strangely he knew what death would be like, some day. Gigantic around him and tiny within him lay latent the enormous dark. Black seed within, black cloak without. When one swooped down to meet the other's swift unfolding, then the last hour would strike.

But not yet.

Someone was coming toward them through the brush. Crouched in hiding, Harding saw Turner's barrel-shaped bulk rise painfully to its full height directly between him and the approaching man. That was the plan, or part of it. He drew a deep breath, grateful anew for the air he breathed. The gun balanced delicately in his hand. He tightened his finger until it pressed cool metal hard. Then he was part of the gun. He couldn't miss.

He could still see nothing except Turner's back outlined against a clear sky, but he knew the familiar, harsh voice that spoke.

"Who are you? How did you—" There was a pause. Then, "Turner! It's Turner! I didn't send for you! I—"

Turner spoke quickly. "Hold on," he wheezed. "I know you didn't. Just let me get my breath back, will you? Near killed me!" He took a step sidewise and lurched heavily, rubbing his leg and swearing in a thick voice. Mayall turned automatically to face him, and now at last Harding saw his face.

It shocked him, somehow, to see that Mayall had grown a beard. He couldn't help wondering instantly, first of all, how the beard would show up in the Composite Image. If Mayall had a Team here—and he must have—would all those blended faces seem to wear it? Or would it be obliterated by the six other superimposed images?

Otherwise Mayall had not changed much. The hollow black eyes burned, under strong, meeting black brows. The gaunt body stooped forward. But Harding did not remember the eyes as quite so fiercely bright, or the mouth as quite so bitter and so violent. And the short, neatly clipped graying beard was a note of unfamiliarity that made Mayall somehow a complete stranger.

Turner muttered: "My leg's asleep," and bent to rub it, stumbling farther around so that he brought Mayall's back squarely toward the hidden Harding.

"Stand still," Mayall snapped. "You shouldn't have come. I'll have to kill you now, and I need you outside. Why did you do it, you infernal idiot?"

"Take it easy," Turner said, painfully straightening. Harding could see through the leaves the outline of the gun in his jacket pocket. From here it looked as if Mayall were quite unarmed. One hand held a microphone, the other hung empty. Mayall could order the paralysis turned on again whenever he chose, of course, but surely it would trap him in the same field if he did. Frowning, Harding waited.

"Now let me say my say before you fly off the handle," Turner was placating the bearded man. "Won't cost you anything to listen, will it? I—"

"Shut up," Mayall said, his voice sinking to a hoarse, angry whisper. "Nobody joins me. Nobody! A machine doesn't need assistants, you fool! You haven't anything to say that I want to hear. Wait—"

He turned his head a little and Harding saw the thin mouth tighten to a grimace that was half grin and half snarl of pure ferocity. Harding was aware of a sudden shock at the violence that gleamed through the smile, so near the surface of the man's mind it seemed to glare white-hot through his grimace. Mayall was not perhaps really insane—but he wasn't sane, either.

"Wait!" Mayall said, and his breath came suddenly loud in the clear, sunny silence. "You didn't come alone. I heard Harding's voice."

Turner let out his breath in a heavy sigh.

"All right, Harding," he said, keeping his eyes carefully away from the crouching man in the underbrush. "All right, let him have it. Shoot, man—shoot!"

Mayall said, "What?" and swung quickly around, raking the brush with eager glances in the wrong direction. The fat, swift hand on Turner's other side dropped toward the pocket where the gun lay.

"All right, Mayall," Turner said in a satisfied voice. "Stand still. We've got you now. Harding, shoot! Shoot!"

Harding stood up in the crackling brush, flicked his gun level and shot the revolver out of Turner's hand.

The bullet went cleanly through the fat man's wrist and whined into the brush beyond. Turner's thick fingers opened. His revolver fell spinning in the sunlight. There was an instant's total silence, broken only by the whispering sound of waves on the distant beach and the raucous scream of a bird somewhere inland, beyond the low hills. The wind brought a vagrant *thump-thump-thump* of machinery from the glitter of roofs half seen above the hill.

Slowly, slowly, Turner lifted his gaze to Harding's. He was gray-white with shock and disbelief, but as Harding met his eyes the whiteness vanished in a swift uprush of deep, angry red. Turner caught his breath and gabbled. There was no other word for it.

"Harding! Harding—I'm Turner! You've shot *me!* I hired you! What

. . . why did you do it? *Why?"* His eyes darted to Mayall and back. "Is it a double cross? It can't be! You wouldn't dare! You know Mayall hates your guts!" His voice cracked. "Why, Harding, *why?"*

Mayall's laughter cut into the disorganized babble. His eyes burned like hot coals deep in the sockets of his skull. His face had the half-demented ferocity of a tiger's, grinning over bared teeth.

"Because he couldn't help it," he said. "Right, Harding? This is wonderful. I never expected this!" He glanced at the shaking Turner, gripping his bleeding wrist with the other hand and still gasping for breath in the depths of his shock.

"You chose the wrong tool, Turner. So you got tired of playing second fiddle, eh? Thought you'd hire an Integration man and take over, didn't you?" He laughed harshly. "There was one thing you didn't know. But—"

"Shoot him, Harding!" Turner cried, clutching his wrist tight and staring down at the welling blood. His hands were shaking like his voice, and a recurrent tremor ran over him so that his whole unwieldy body quivered like a large jelly. "Go on, shoot!"

Mayall laughed. "Go on, shoot!" he echoed in a mocking falsetto. "Go on, Ed. Why not shoot me?"

"You know why," Harding said.

"Why not?" Turner's voice was high with terror.

It was Mayall who answered him, with mocking politeness.

"You didn't know?" he demanded of the quivering fat man. "Hadn't you heard about the posthypnotic compulsions they jinx you with when you join an Integration Team? Didn't you know that no Team member can ever injure another Team member, no matter what his provocation is?"

Turner stared stupidly at the man. His jaw dropped a little.

"But"—he swung toward Harding—"you . . . you didn't tell me! You let me think . . . it's not true, is it, Harding? Go ahead and shoot, before he—"

"Go ahead, Harding, try!" Mayall's voice was ironic. "Pull the trigger! Maybe you can do it. I'm not on the Team any more, remember?"

"Neither am I," Harding said gently.

A slow grin spread over Mayall's haggard face. His eyes burned.

"Kicked off too, eh?" he said, exultations in his voice. "That's good. That's wonderful! Kicked off just like me! How do you like it now, Ed? How does it feel?" The grin faded slowly. "A little bit lonely, maybe? You don't fit in anywhere?" His voice softened reminiscently. "You can't really think without an Integrator, you're an expert on an Integrator but you aren't allowed near one. You try joining lots of outfits. No good. What you want is the Team again, the chance to use your mind and your talents. You're lost without a Team."

Suddenly and harshly he laughed. "Well, I've got a Team!" he said.

"My own. My own backers, my own Integrator. Everything you tried to take away from me when you got me kicked out. Now you know what it's like. Maybe you think I'll take you in. I'm not the fool you think, Harding. I know you! You have to be top dog or nothing. But you've made the last mistake of your life." He hefted the microphone and laughed his harsh, mirthless laugh.

"I've got the drop on you, even without a gun. You can't touch me, you fool. I see it in your stupid face. But I can kill you!"

Turner made an unsteady, bleating sound and swung round violently toward Harding, blood spattering from his wrist.

"It isn't true!" he said hysterically. "You can kill him if you try! Pull the trigger, Harding! This is suicide if you don't!"

Mayall showed his teeth. "That's right," he said. "But he can't do it. We were closer than brothers once. Cain and Abel." He laughed. "Any last words, Harding?" He lifted the microphone. "All I have to do is recite a series of numbers into this," he said. "It's automatic. The field reacts to the same group only once, in progressive series, so you needn't bother trying to memorize it. Then the frequency hits you both. I may let you die right now, or I may—"

"You won't do a thing," Harding said, smiling. "You can't, George. It would constitute an injury to me, and you can't do it."

Mayall flourished the mike, breathed gently into its black mouth. His eyes burned at Harding over the instrument. Everything was very still around them. Distant surf hissed upon sand, the brush rustled in a light breeze, machinery thudded like the beat of blood deep inside the arteries of the body, as if the island were alive. Three gulls sailing over on narrow wings turned curious heads sidewise to observe, yellow-eyed, the motionless men below. Beyond Mayall's bearded head the heaven-pointing muzzle of the spaceship loomed like a silver halo. Invisible above it hung Venus, blanked out by the blue dazzle of the day but swinging as if on tangible cord that linked it irrevocably to Akassi. Sixty-one thousand of the ex-Earth-born pinned high upon the chart of the heavens by a diamond pinhead waited, though they did not know it yet, the outcome of this conflict on Akassi.

"*I'm* free," Mayall said, holding the mike against his mouth. "I know when I hate a man. I can kill you whenever I choose."

"You said that before," Harding pointed out. "Go ahead."

"All I have to do is give the series into the mike," Mayall said.

"Yes. Go on. Do it."

Mayall drew an oddly unsteady breath and said into the microphone:

"Three-forty-seven-eighty . . . ah . . . eighty-two." He paused briefly. "Eighty-*five*," he corrected himself. And waited.

Nothing happened.

The brush rustled. The surf breathed against the shore. Mayall flushed angrily, gave Harding a quick, defensive glance, and said into the mike, "Cancel. Three-forty-seven-*seventy*-five—"

The breeze whispered among leaves. The distant throb beat like blood in their ears. But no shadow stooped out of the sky and no shiver in the air answered Mayall's command.

Turner laughed, a half-hysterical giggle. "So it's true!" he said. "You can't!"

Mayall's face went dark with anger and a pulse began to throb heavily in his forehead. He shook the microphone, cursed the insensate machinery and stammered the numbers a third time into the diaphragm, stumbling twice as he spoke them.

For a timeless moment the three men stood motionless, waiting.

Then Turner laughed aloud and wheeled ponderously upon Harding. Ten feet of space separated them, and Harding had let his gun-hand drop—

The impact of the fat man's sudden onslaught caught him off guard and sent him staggering. The gun flew out of his hand as Turner's great, unstable bulk all but knocked him off his feet. They reeled together for an instant.

When they got their balance again Turner's huge forearm was locked across Harding's throat, blood from his wounded wrist trickled down Harding's shirt, and Turner's good hand pressed the point of a small, cold, very sharp knife against Harding's jugular.

The fat man was breathing hard.

"All right, Mayall," he said with a painful briskness, though his voice still shook. "My turn now. If this whole idea's a trick, let's find out about it! I don't know what you've got to gain by lying to me, but you can't kill me unless you kill Harding. Go ahead—turn on the paralysis again. But before you can give your signal, I can cut Harding's throat. Go on. What's stopping you?"

Mayall's face darkened terrifyingly with rage. The grizzled beard jutted straight out with the set of his jaw, and the pulse at his temple throbbed.

"Don't tempt me, Turner!" he said in a grating whisper.

Turner laughed again. "Is it true?" he asked incredulously. "I almost think it is! I almost believe you've got to save Harding's life! All right, then." The knife-point pressed deeper. Harding felt the sharp twinge of breaking skin, and then a sticky trickling. "I'll kill him unless you do as I say."

"I wouldn't bet on it, Turner," Mayall said in a choked voice. "I—"

"I've got to bet on it," Turner wheezed past Harding's ear. "It's my one chance. I'm gambling for my life. And I'll win. You'd have turned on the paralysis by now if you dared. How do you walk through it, Mayall? No, never mind. I want to know first of all what this game is. No, Harding, don't move!"

He shook Harding a little. "I

want some answers! Are you working in cahoots with Mayall? Why did you come here, if you knew you couldn't protect yourself from him? Unless you're working together, I don't see—"

Mayall made a sudden, involuntary gesture of rejection.

"You think I'd work with *him?* You think I could ever trust him again?"

"Shut up!" Turner said. "No—stop it, Mayall!" The knife-blade quivered at Harding's throat. Mayall paused rigidly, the microphone halfway to his lips, eyes on the knife as he struggled against almost unbearable compulsion.

The last thing Harding saw was Mayall's thin lips moving as he hissed into the diaphragm. Then darkness fell—total blindness, sudden and absolute.

For the second time in ten minutes Harding had a strong illusion of just having died. His first idea was that the knife at his throat had gone in, and this blindness was the first failure of the senses that presages total failure—but he could still hear. The surf still whispered on the far-off shore. Invisible gulls mewed overhead and Turner's wheezing breath caught with a gasp close to his ear.

He could still feel. Sunlight was warm on his cheek, and Turner's thick arm across his throat jerked with some sudden shock of astonish-

ment. Turner grunted and the arm went a little slack.

Then all Harding's reactions snapped into instant alertness. Somehow Mayall had given him this one split-second chance to save himself if he could. Theoretically, he knew what had happened. Frequency juggling was a familiar trick, and phase-cancellation of vibration must have been the process Mayall's hiss into the mike set in motion. The frequencies of the visual spectrum were being canceled now, by a broadcast of other frequencies in the right phase. But visual only, since he could feel the sun's infrared heat on his face. If Mayall had an infrared viewing apparatus handy Harding would be clearly visible now.

He worked it all out neatly in a corner of his mind while his body sprang almost of its own accord into this instant's hesitation that slowed Turner's reactions. Harding's right arm struck upward and outward inside the curve of Turner's arm as it held the knife to his throat. He felt the pressure of the blade cease, and Turner grunted heavily as Harding's elbow drove into the pit of his stomach. For an instant they struggled fiercely together in the blinding dark. Then Harding sprang free.

Brush crackled and heavy feet thudded rapidly on the ground, diminishing in distance as Turner, gasping for breath, blundered away through the dark. Harding stood still, breathing heavily, feeling sunlight warm on his face as he stared about in the intense and total blackness.

The very completeness of it told him one interesting fact—there must be a roof over the island. It was almost impossible to create darkness in the open air. In all probability some intangible dome of ionization hooded Akassi in, something that could be varied at will, used to reflect downward any frequency-beams aimed up, a simple matter of angle-of-incidence calculation you could work out in your head. Somewhere on the island a device was broadcasting a beam in the right frequency to cancel the vibrations of light blazing down from the hot, invisible tropic sky.

Mayall's voice spoke out of the darkness, after a long, reluctant pause.

"Are you all right, Ed?"

Harding laughed at the note of hope in the question.

"Disappointed?" he asked.

Mayall's breath went out in a long sigh. "I hoped he'd get you. I did what I could, but I was praying for the knife to go in. At least, I can get Turner."

"Don't," Harding said with some urgency. "Let's have the light again, George. But don't kill Turner yet. I want to talk to you first. If he dies the whole espionage network he controls will fall apart, and we're going to need it. Do you hear me?"

The darkness went crimson before Harding's eyes, quivered, shredded and was gone. Day was blinding. He put up a hand to shield

his eyes, seeing through his fingers Mayall's sardonic grin, the lips turned downward in a familiar inverted grimace.

"I hear you," he said. He lifted the microphone and spoke into it, his eyes still holding Harding's gaze. "Sector Twelve," he said into the mike. "Twelve? Mayall speaking. There's a fat man crossing the hills toward you. Kill him on sight." He lowered the mike and showed his teeth at Harding. "You've got maybe fifteen minutes to live," he said. "Just until I get my Team together and dope out a way to kill you. Maybe I can't beat the compulsion alone. But there are ways. I'll find one."

"You're cutting your own throat if you kill Turner."

"It's my throat," Mayall said. "I give the orders here. He can't get away." Suddenly he laughed. "This island's a living thing, Harding. A reacting organism with sense organs of its own and an ionized skin over it. I've got surrogate sensory detectors all over the place. They can analyze anything on the island down to its metallic ions and transmit the impulses back to . . . to headquarters. I've set up an optimum norn, and any variation will put the whole island in motion. Turner's like a flea on a dog now. The island knows where he is every second."

"We're going to need him," Harding said.

"You're going to be dead. You won't be interested."

Harding laughed. "Never very practical, were you, George? You were always a bright boy, but you theorize too much. You need somebody on your Team like me. Only luck kept Turner from drilling you. Luck—and me. Look at you, standing there unarmed. What was the idea, coming out like that? The island might have been crawling with Turner's men."

Mayall grinned his wide, thin-lipped, inverted grimace.

"Ever have hallucinations, Ed?" he asked, his voice suddenly very soft. "Maybe that's the real reason they threw you off the Team. Ever hear voices out of nowhere? Look at me closely, Ed. Are you sure I'm real? Are you *sure?*"

For a moment longer the tall, gaunt, stooped figure stood there vividly outlined in the sun. Then Mayall smiled and—faded.

The trees showed through him. The silver bullet of the spaceship towered visibly behind the ghost of George Mayall. The ghost went dim and vanished—

Mayall laughed softly and unpleasantly out of nowhere.

Harding was aware for a moment of a tight coldness at the pit of his stomach. It couldn't happen. It hadn't happened. He had dreamed the whole thing, or else—

"O.K., George," he said, trying to hide the sudden limpness of his relief. "I get it. Where are you, then? Not far, I know. You can't project a tri-di image more than a hundred feet without a screen—or five hundred with relays. Let's stop playing games."

Low down in the brush Mayall laughed thinly all around him. Harding felt the hair creep on his scalp. It was not the laughter of a sane man.

"Start walking," Mayall said. "Toward the settlement over the hill. By the time you get there, I'll have a way figured out to kill you. Don't talk. I'll ask questions when I'm ready."

Harding turned in silence toward the gap in the hills.

From the hilltop he could see the settlement glinting in the sun. There was the square Integration Building with its familiar batteries of vanes on the roof, and the familiar tower thrusting a combing finger up against the sky. Long sheds lined the single street. There was a fringe of palm-leaf huts around the buildings, and farther off, over a couple of rolling green hills, the lofty tower of the spaceship balanced like a dancer on its hidden fins.

Still farther out were black rock cliffs, creaming surf and a lime-green sea with gulls wheeling over it. Brown figures briefly clad in bright colors moved here and there about the buildings, but Harding saw no white man anywhere. Only the machinery thumping endlessly at mysterious tasks hinted at their possible presence under cover.

He started slowly downhill. A palm tree leaning stiffly forward over the path rustled, cleared its throat with a metallic rasp, and said:

"All right, Ed. First question. Why did they throw you off the Team?"

Harding jumped a little. "Where are you, George?"

"Where you won't find me. Never mind. Maybe I'm in my getaway ship, all set to take off for Venus. Maybe I'm right behind you. Answer my question."

"Rugged individualism," Harding said.

"That doesn't mean anything. Go on, explain yourself. And keep walking."

"I was kicked off," Harding said, "because I was so different from you. Exactly your opposite, as a matter of fact. You were the leader of the Team and you held the rest down to your level because you weren't adaptable—remember? It didn't show up because you *were* leader and set the pace. Only when a new man came in did your *status-quo* limitations show. The new man, in case you've forgotten, was I."

"I remember," the palm tree said coldly.

"You fizzled. I skyrocketed," Harding said. "I had too many boosters. They finally figured I was getting into abstract levels far beyond the Team, which is as bad as being too slow. So *I* was fired for undependable irrationality, which I prefer to think of as rugged individualism. Now you know."

Ten feet ahead a flowering shrub chuckled.

"That's very funny. *You* were the stupid, unadaptable ones—you and

the rest. You couldn't realize I was simply developing along a new line, a different path toward the same goal. I wasn't lagging behind. I was forging ahead of you. Look around you. This island's the living proof. You kicked me into a pretty unpleasant gutter and I pulled myself up by myself. Not easily. I built a living island here. You can have six feet of it, and that's all."

The bush sighed. "I've dreamed of killing you," it said, rustling gently. "But I'd have left you alone if you'd stayed out of my way. I've never forgotten, though. And I'm going to get even, when the time comes—with you, and the rest of the Team, and Earth. And Earth!"

Harding whistled softly. "So that's the way it is," he said to the empty air.

The moss underfoot said bitterly: "That's the way it is. I don't care what happens to Earth now. Earth's overreached itself. Let it blow up. It and its Teams. I'll throw a shield around Venus that no power in the solar system can crack."

"Maybe that's your trouble, George," Harding told the moss. "You think in terms of shields that can't be cracked. Sooner or later the pressure from within may force a crack. Growth can't be stopped. That was what went wrong on Team Twelve-Wye-Lambda, remember?"

The moss was silent.

"Anyhow, it checks," Harding went on, trudging downhill. "Central Integration when I . . . ah . . . left the Team, was sending out dope-sheets on an enormously complex plan under way on Venus. That would be you, George. Stuff too complex to figure out and counter without a lot of work among the Teams linked up in units. Obviously the Secessionists had themselves an Integrator at last. It didn't take a Round Table session to find out who they'd subsidized."

The moss laughed.

"It was a mistake to let me go," it said. "Do you want to know the real reason? It's the reason why no Integrator that Earth ever sets up can control Venus. The basic logic's wrong. Their key principles are based on Venus being a social satellite of Earth—and the balance has shifted. *I've* shifted it, Ed. Venus is no protectorate planet any more. That's Apollonian logic. Not a single Integrator on Earth is based on the Faustian viewpoint, which in this case is perfectly simple—Venus is the center of the new Empire!"

"You think so?" Harding murmured.

"I made it so! Every single premise the Earth Integrators base on a . . . a geocentric society has got to turn out wrong. Or multiordinal, anyhow—valid only as long as the truth of Earth's power is maintained. I stopped believing in the old truth-concepts of the Earth Empire—and they threw me off the Team.

"But right here on Akassi is the only Integrator that works from the basic assumption that Venus is the System's center."

"All right," Harding said calmly.

"Maybe I agree with you."

"No," an airy whisper said above the whisper and rustle of a red-flowering vine that hung across the path. "Not necessarily. How do I know you've really been kicked off the Team? How do I know you're not a Trojan horse?"

"There isn't much you can be sure of, is there?" Harding asked. "Your Team here can't be very efficient. You've forgotten basic psych. Why do you suppose you've dreamed of killing me?"

"Prescience," the vine said quietly.

"Displacement," Harding told it. "Who would you be wanting to kill? It couldn't be—yourself?"

Silence.

"What kind of a Team have you got, anyhow?" Harding asked after a moment. "If it can't answer a simple question like that, it can't be worth much. Maybe you need me, George, even more than I need you."

"Maybe I haven't got a Team," the vine said behind him, in a die-away voice as the distance lengthened between them.

"You'd be a maniac if you hadn't," Harding told the empty air flatly. "You've got to have a Team, if you're operating an Integrator. One man couldn't keep up with it. You need a minimum of seven to balance against a machine like that. You have a Team, all right, but an incompetent one. I'll tell you exactly what you've got—either discarded misfits or untrained men. That's all there is available. And it isn't good enough. You need me."

"You're not wanted here," a clump of bamboo said hissingly, rubbing its fronds together. "If my backers had needed another Integration man, they'd have got in touch with you. I'm all they need."

Harding laughed. "Thought of a way yet to kill me?"

The bamboo did not reply. But presently a patch of gravel hissed underfoot and said, "Go down into the village. There'll be a door open in the Integration Building." And a lizard that looked curiously down at him from the top of a flat stone appeared to add in Mayall's voice, "Maybe I've found a way—"

Harding pushed the heavy door wider and looked into the green-shadowed room. Sunlight filtering through leaves outside its broad windows made the dim air seem to flicker. Frond-shaped shadows moved restlessly upon banked controls which were the nerve-endings of the island.

In the center of the web George Mayall sat, his sunken eyes glittering, grinning above his beard at the door.

Harding stood still just inside the door and drew a long, deep breath. The smell of the room, oil and steel, the feel of it around him, the faint throb that traveled from the floor up his body and blended with the beating of his heart, made him a complete man again as he had not been for a long time now. He stood in the presence of the Integrator. He *was* the Integrator.

He closed his eyes for a moment. When he opened them again he saw that Mayall's sardonic grin had widened and drawn down at the corners.

Harding nodded. "Alone?" he asked.

"What do you think?" Mayall said, and his glance flickered once toward the inner door at his elbow—the door without a knob, but a flat plate inset where the lock should be. Harding could see through the steel panels as if they were glass, because he knew so well what the little black-walled room inside looked like, with its tri-di screen and its table and its chair.

"You've been here all along?" Harding asked. *"Are you here now?"*

Mayall only grinned. Harding took out a cigarette, lit it, inhaled smoke. He strolled forward casually toward the inner door, glancing around the big room as he crossed it. A control room is seldom as spectacular as the operational devices it controls. Most of the equipment looked familiar. It was what lay out of sight that interested Harding most. For this was only the antechamber to the Integrator.

"That's far enough," Mayall said after a moment. Harding stood still, the smoke from his cigarette wreathing ahead of him toward the man behind the control desk. Mayall swung his hand edge-on, chopped through a swirl of smoke. His grin turned down farther at the corners.

"I'm real," he said. "Don't bother with smoke tests. Clever, aren't you? Stand still, Harding. Don't come any farther. I've got one more question to ask you and then—well, we'll see."

"Fire away," Harding said, looking at the door with the plate in it.

"Second question, then," Mayall said. "Second and last. Just what did you hope to accomplish by coming here?"

Harding blew smoke at him. "It could be almost anything, couldn't it?" he said. "Maybe I came to ask *you* a question. Could you guess what it is? Or would you rather I didn't speak at all?"

Mayall regarded him with narrowed eyes, burning black in hollow sockets.

"Go on," he said after a pause.

Harding nodded. "I thought you'd say that. Maybe you've been expecting somebody with—a question. Put it like this. You say all Integration has to fail that doesn't figure Venus as the center of the social solar system. Right?"

"I said that," Mayall agreed cautiously. "What's your question?"

"Why Venus?" Harding inquired.

"What?"

"You're not stupid. You heard me. *Why Venus?"*

Mayall licked his lips suddenly, with a quick, flickering motion, and glanced once at the big TV screen on the wall, nervously, as if the blank screen might be watching him.

"There are other Thresholders," Harding went on. "You just pointed

out that if your backers had needed another Integration man they'd have got in touch with me. Well, maybe somebody did. Not necessarily your boys, but—somebody." He blew more smoke. "Shall I go on?"

Mayall did not speak a word, but after a second he nodded jerkily.

"What you've got here is priceless," Harding said. "The group you back has a chance to win independence from Earth. So I just wondered . . . now, you take Ganymede, for instance. A flourishing little colony they've got up there. Doing a lot of exporting these days. A very rewarding business. Plenty of money in it. What would you say, George, to setting up a little problem in the Integrator to see if you could figure Ganymede as a social center?"

Mayall did not move for a long moment. Then he drew a shaken breath.

"I don't believe you," he said. "You're lying. You're trying to trick me."

Harding shrugged.

Mayall leaned forward over the control desk.

"What proof have you got?" he demanded, his voice hoarse.

Harding threw back his head and laughed. Then he took one final deep pull at his cigarette, threw it to the floor, ground it out under his toe.

"All right, Mayall," he said crisply. "You can step down now. I'm taking over."

Mayall jerked back in his chair, startled and incredulous. His tongue came out again and touched his lip lightly.

"Like hell you are," he said. "You can't throw a scare into—"

"Shut up!" Harding snapped. "Get on your feet, George. I mean it! Out of that chair and open the door for me. I've played it your way till now. But I know all I need to know. I'm a lot smarter than you ever were. I *can* take over, and I'm doing it. And you can't do a thing to stop me. You *can't* kill me! So I'm giving you one last chance—to join *me*."

"You . . . you're insane!" Mayall said, in a stunned voice. "This is *my* island. I know every nerve-center on it. My men could—"

"Could do everything but injure me," Harding said, and stepped forward briskly. "So you lose. Let's put it to the test now. I'm tired of talking. You had your fun, and you've told me enough so I know who'll win this little game."

"You're crazy!" Mayall cried, scraping his chair back. "I'll have my boys kill you! I . . . I'll send you off the island. I—"

"No you won't," Harding told him, rounding the corner of the desk. "Because you aren't sure. Maybe I've got that proof from Ganymede right here in my pocket. You want to bet I haven't? We'll call your Team together and see what—"

"Oh no you don't!" Mayall shouted, his voice shaking. "You'll never see my Team!"

"Afraid I'll get you kicked off

this one, too?" Harding asked ironically. "Up! Out of that chair, George. You're going to work the trick lock on that door over there and open up your Round Table. Oh yes, you are. Then you'll call your Team together and we'll make a few trial runs. You needn't worry, George. You're perfectly safe. You and I couldn't hurt each other if our lives depended on it—and maybe they do. It doesn't make a bit of difference. Open the door."

"You'll never get that door open," Mayall said, stepping backward.

Harding snorted impatiently.

"Here, get out of my way," he said. "What kind of a code have you set it for? I haven't time to argue about it."

He ran his hand experimentally over the surface of the metal plate set where the lock should be. Between plate and palm he felt the varying pressures slide soft and rippling. There was something familiar about the pattern of the pressure. It could hardly be the old cipher, the original team-code that had opened the doors to seven Round Tables, far away in time and space. It could hardly be that, and yet—

The door swung gently open under Harding's palm.

Mayall jerked around, his breath rasping with surprise.

"Who told you my code?"

Harding frowned at him. "It's the old code. Didn't you realize that?"

"You're crazy. It can't be. I made it up, arbitrarily. Why should I have used the old code?"

"You've been fighting yourself all down the line, haven't you?" Harding said, and stepped through into the little black-steel room.

Mayall stumbled after him, stammering protests. "It can't be! You're crazy! You found it out—somehow."

Wearily Harding said over his shoulder; "You must have flunked basic psych, George. It's the old cipher, but it unlocks a different door now, no matter what your unconscious had on its mind when it set up Twelve-Wye-Lambda's key. *That* door will never open again for you. Or me. This one will have to do, and it's good enough for me. Now let's have a look at your Team. Who are they, George? Where are they?"

Mayall laughed, a high whinny of mirthlessness.

"You'll never know. I'll kill you first."

Harding snorted. "Think so? You're welcome to try."

"You can't get to my Team!" Mayall shouted. "They . . . they're all on Venus. They're—"

Harding swung round and regarded the excited man with a sudden, quickened surprise. "Don't talk like a fool, George. Of course they're not on Venus. What's the matter with you?"

"They *are* on Venus!" Mayall cried. "That's it! And if you call them together to talk about Ganymede—you know what they'll do, don't you? So you can't do it, Ed! You can't!"

Harding turned around complete-

ly and looked at Mayall with a frown between his brows.

"What's wrong with you, George? I think you really are a little crazy. Are you *jealous,* George? Is that it?" He laughed suddenly. "Maybe I've got something there. You think you *are* the Integrator, is that the trouble? Well, George, my friend, I may not be able to kill you even if my life depends on it, but—*I can dismantle your Integrator!* How would you like that?"

Mayall drew a whistling breath between his teeth. He stepped backward into the open doorway, leaned to grope toward his desk, his sunken eyes not moving from Harding's. Then he let the breath out in a sigh and straightened. There was sweat on his face and he was breathing hard.

"Stand back, Ed," he said grimly. "Get away from that table. Now I can do it! Now I know I can kill you!"

Harding looked down into the black eye of the pistol trained upon his middle. He lifted his gaze to meet Mayall's murderous stare.

"Go ahead," he said. "Try."

Sweat trickled down Mayall's forehead. His beard jutted. Ridges of tendon began to stand out on the back of his gun hand. But the crooked finger inside the trigger guard didn't move at all. He lowered his head, staring at the gun. Then he brought his left hand forward to grip his right in reinforcement. Both hands were shaking badly.

"Threshold reactions happen inside the body," Harding said. "What good will that do?"

Mayall's breath whistled through his teeth more sharply than before. He looked up at Harding, a white, frantic glare. Suddenly he closed his eyes, squeezing the lids shut. Panting, he tried to pull the trigger.

His gun hand quivered—quivered

and began to swerve. Slowly it moved until the gun muzzle pointed beyond Harding, toward the wall.

Now the gun cracked, six times, six sharp explosions that blended into one. Mayall's eyes stayed shut. His gun hand dropped.

"I did it," he said in a whisper. "I've killed you. I—"

Slowly he opened his eyes and looked into Harding's. Then his gaze went farther, resting upon the six silvery star-shaped holes in the black wall.

Harding shook his head gently. He turned his back upon the man in the doorway, dismissing him. He pulled out the chair that faced the tri-di screen and sank into it.

Then the chamber of memory slid softly over to superimpose upon this real chamber. The little square black-steel room was suddenly a part of Harding, as close and warm as the domed walls that shielded his living brain.

He laid his palms flat on the metal plate.

At first it was like wind under his hands, then water, then soft sand gently embedding his palms. Soundlessly he spoke. "Ready, boys," he said. "Come in."

"You can't do it, Ed," Mayall said behind him. "You can't—"

In the outer room a sudden crash sounded. A sudden voice shouted with a wheeze in it, "Mayall! Harding! Do you hear me? Turner speaking! Mayall, answer me!"

Harding twisted in his chair, glancing up with a startled face to meet Mayall's eyes. Mayall swung up his empty gun and spun too, toward the door. The antechamber was empty, but Turner's harsh breathing filled it with sound. And on the wall-screen Turner's sweating, unstable face glared blankly at the unoccupied room.

"Mayall!" the fat man shouted. "I know you're there! Step out where I can see you, or I'll blow the whole island sky-high!"

Harding said softly, with derision in his whisper, "So Turner couldn't get away, eh? Just like a flea on a dog—you know where he is every minute. Oh, sure. Now what? Is he bluffing?"

"Harding! Mayall!" Turner's voice made the antechamber echo. "I know you're there. I saw you both go into the Integration Building. I'll blow up Akassi and everything on it unless you do as I say! I mean it! I'll give you a ten-count, starting now. One. Two. Harding, do you hear me?"

"All right, Turner," Harding called, not stirring from his chair. "This is Harding. What do you want?"

The wheezing voice sighed with relief.

"Step out where I can watch you, Harding. Mayall, too. I—"

"Where are you?" Harding interrupted. "You're bluffing."

"I'm at the relay station on the hill. There's a lake south of me and I can see the village. I can see the Integration Building from here, and

the door to it, Harding. I'll blow you up! I mean it!"

"You couldn't blow anybody up," Harding said, and moved his fingers urgently on the table. In a whisper he urged the tri-di screen, "Come in, boys! Come in!"

"It's no good, Harding," Mayall said, also in a whisper. "I told you. You can't work it. Nobody can but me. And I won't. You'll never see my Team!"

"Listen to me, Harding!" Turner's voice insisted from the antechamber. "Step out here and look. You'll see! I've got a UHF beam pinpointed and focused right in the middle of the fuel tanks of the spaceship. You know what ultrasonics can do, Harding?"

"I know," Harding said flatly. "If that spaceship blows, you go with it. Or do you mind?"

"How long would I live if I'm caught?" Turner asked logically. "Now do as I tell you, or—"

"It's a bluff," Harding said laconically, aloud, and bent over the table, his palms molding the test-pattern with frantic speed. *"Come in, come in, boys!"* he cried in an urgent whisper.

Mayall laughed sardonically and very softly at his shoulder.

"It's not a bluff!" Turner shouted, his voice thick. "Look here! I broke into the relay station. I got the beam up fast through the hot frequency into UHF—so fast the fuel didn't have time to blow. Then I pinpointed it right in the middle of the tanks. I've got my hand on the lever. As long as I hold it there, O.K. But if I let go, or if I'm killed—what happens?" Triumph wheezed in the fat man's voice. "The beam runs down the scale. On the way it hits the hot frequency. In the fuel tank! I can drop it to hot as fast as I can move my hand. Now, am I bluffing?"

"You'll never do it," Harding called. "I don't believe you."

Turner was silent for a hard-breathing moment. Then he shouted suddenly:

"I've got it! You'll *have* to do as I say! Harding, are you listening? You can take the chance with your own life if you want to—*but can you take it with Mayall's?* He's in there—I saw him go in. Mayall, do you hear me? You've got to do as I say or Harding will die with everyone else on Akassi! Come out, Mayall! Harding, come out! I mean it. I'll finish the ten-count and then the whole island goes. Three . . . four—"

Harding met Mayall's eyes. He shrugged reluctantly.

"He's got us," he whispered. "Unless—" Suddenly he shoved back the chair and jumped to his feet, laughing in soft triumph. "Unless *you* call together the Team, George! Maybe I can't, but you can and you've got to . . . to save my life! Here, sit down and get at it, quick!"

For an instant longer Mayall only stared at him, blank-faced. Then—

"All right!" the bearded man snapped. "I will!" His manner changed abruptly and completely. Faced with a threat he could counter, his mental indecisiveness vanished

in a breath. He flung himself into the chair and slapped both hands down hard on the plate.

"Seven . . . eight—" Turner called from the screen. "Harding, you've got about three seconds left to live. Step out here, or—"

"Go on, step out," Mayall said softly over his shoulder, his voice crisp with new decision. "I've got an idea."

"Oh, no," Harding whispered. "I want to see your Team. I'm going to—"

"You're going to die if you don't! He isn't bluffing. Listen, now! Go out and keep him quiet while I figure out an answer with my Team. You haven't any choice, Ed! *My* life depends on it, too!" He flashed a sardonic glance upward. "Look, Ed—tell him I'm dead. Tell him you killed me. Otherwise he'll insist I come out too, and I can't. Go on, quick!"

"Nine—" Turner called. "Harding, are you listening? On the count of ten the whole island blows. Mayall, do you hear? I'll—"

"Hold on, Turner," Harding said laconically, and stepped out of the door into full view. "Mayall can't hear you. He can't hear anything. I . . . I've just killed him."

Turner glared down at him from the wall. His fat face was scratched and trickling with blood from the underbrush he had run through. His clothing was torn and he had tied up his wounded wrist with a soaked rag. His good hand rested above his head on a poised lever. He was leaning heavily upon the face of the TV screen, so that he seemed to rest against empty air in the wall above Harding. Beyond him, through a window, a blue lake twinkled, and a road wound down through thickets, among trees and valleys to reappear as the village street. Harding could see the image of Integration Building clearly, with its open door. He had a moment's dreadful impulse to step to the door and wave at himself.

"Dead?" Turner repeated, and sighed gustily. "I thought . . . I thought you couldn't kill him."

"So did I," Harding said dryly, with a glance at Mayall through the inner door. "Up to the last minute. Then I had to. You can relax now, Turner. Mayall's dead. There's just two of us now, and we'd be fools not to work together."

Turner laughed.

"I trusted you once," he said. "Come out of the Integration Building and walk north. Head for the relay station. You'll spot it when you get to the top of the hill. We'll talk a lot better when I'm pointing a gun at your belly."

"Everybody keeps pointing guns at my belly," Harding said mildly. "I'll develop a stigmatic target if this goes on. Relax. I could blow up the island too, if I felt like it. This building's the control center for the whole setup, and I know practically every gismo here. Wait a minute, Turner. I want a cigarette." He turned his back to the screen, search-

ing upon the desk top as if for matches. "Mayall, get busy!" he whispered, rolling his eyes sidewise. "What's the delay for? Call your Team!"

"Harding," Turner said from the wall. "Turn around here. I don't trust you. Come out of that door and start walking north. I mean it!" His fat hand quivered on the lever.

"All right," Harding said. "Take it easy. Can't I light a cigarette first?" He cupped a match in his hands, and in their shelter looked anxiously at Mayall. The bearded man had taken his hands off the Round Table plate and was scribbling busily in large letters on a pad.

"No time for the Team," he whispered. "Look—read this." He held it up. Harding blew smoke and scanned the lines of writing. He nodded very slightly, turned to face Turner on the screen.

"Relax," he said. "I'm on my way. Just take it easy—we need each other now. I'll play along with you."

"Have you got any choice?" Turner demanded angrily.

"Maybe not. Any last instructions? Because after I leave this building we can't talk. I'll be beyond reach of any TV screens."

"Get going, that's all. If I don't see you before I count to—"

"Hold on!" Harding said. "I've got some . . . some stairs to climb before I reach the door. This room is two flights underground. I'll be outside in about twenty seconds. Don't be rash!"

"Twenty seconds, then," Turner said. "I'm starting to count now."

Instantly Harding turned and stepped toward the inner door, outside the range of the screen.

Mayall moved ahead of him, on tiptoe, every gesture precise and accurate now that he had a definite job to do. But Harding didn't like the suggestion of a satisfied smirk half hidden by his beard.

"Mark time!" Mayall said urgently. *"Mark time!"*

He had swung open a section of the wall, revealing within, between parted chain mail curtains, a little cubicle hung with glittering, swinging mesh from floor to ceiling. A shove sent Harding staggering into the shining tent. The curtains closed behind him. Mayall's whisper sounded disembodied from outside.

"Mark time—but stay in the same place. Like a treadmill." A switch clicked loudly somewhere beyond the curtain. "You're on. He can see your image. Start moving, Ed."

Suddenly, without having moved a step, Harding found himself facing the village street. In perfect reflection upon the swinging walls around him he saw dusty road patterned with sun and shadow, the sheds across the way, the Integration Building looming behind him, its door swinging open. Then the street swung smoothly from right to left before him, lay out straight toward the vanishing point between two distant hills. It was exactly as if he and not the street had turned.

"Mark time, you fool!"

Harding belatedly began to walk, swinging his arms a little, moving his feet, almost taken in by the illusion of what he saw around him. It seemed strange that the breeze which made the leaves move soundlessly did not ripple his own hair.

To all intents and purposes he was actually outdoors, walking at a leisurely pace toward the hills beyond which the spaceship towered. Overhead was the clear sky and the sun. Around him, stereoscopic and in perfect perspective, lay the village. Again the images swung dizzily and he was facing in a new direction as the path turned itself under his feet, sliding backward below him at the rate of a man's normal walk.

"Don't stop for a second," Mayall's voice said from the other side of that unreal curtain which looked like the airy distances between Harding and the hills. "Keep walking, and keep in the path. Your image is being projected outside—like a mirage. Turner's watching you. It's a moving mirage. Your image is being moved forward across the island at a slow rate of speed, but you've got to keep your feet treadmilling or Turner may get suspicious. Can you see your way?"

"Just as if I were outside," Harding said, marking time. "Is it all right to talk?"

"For a few minutes, yes. You're still too far away for him to see your lips move, and I've got the sound cut. I've set the projection for straight on down the road and over the two hills to the relay station. It'll take care of itself now as long as you guide your course so you don't seem to be walking in the air or through the houses."

"Nice work," Harding said admiringly. "I've seen something like this done before, but only under restricted lab conditions. How do you do it?"

"Wouldn't you like to know?" Mayall said mockingly. "This whole island *is* a lab. Or a theater. All I need is a specially sensitized frequency beam reflected down from the ionized island roof, to serve as light-sensitive cells. I've got projecting device, carrier and receiver, two sets of them, one for you here inside and one for the outdoor illusions. Two-way visual projection, plus a mobile unit, chiefly a series of relay zoom lenses. But the details are my business, naturally. All you need to know is that you'll keep marking time with your feet for about ten minutes before your projected image comes within clear sight of Turner, and he comes in sight of you—exactly as if you really were walking through the village. Only, this way I can keep my eye on you."

"Get busy, then," Harding urged the blue hills before him. "Make it fast. Turner *will* use that hot sonic once he finds out he's being tricked."

"I'm calling the Team now—"

Harding turned sharply toward the sound of the voice. His steps on the sliding road faltered. He glanced

back at the curtains through which he had entered, meditating possible action.

"Don't you do it!" Mayall's sharp voice snapped, as if the hills had spoken. "I'm watching you. You can't do a thing but stay put and keep walking. If you step out of line, we both die. Remember, my life depends on you!" He laughed. "The Team's coming in now. Don't strain your ears. You won't hear a thing. I've got that sound cut."

"You may not need the Team," Harding said, trudging in one spot doggedly. "Why not order the spaceship to take off? Then Turner can't—"

"Oh no. That's my insurance. Without it, I'm immobilized. Besides, it wouldn't work—you see why, don't you?"

Harding nodded. Of course he saw. The usual slow-starting take-off would give Turner time to keep his beam focused on the fuel tanks while he exploded them, and a top-speed take-off, never used on Earth, would blast the entire village. Space flight, to be safe, was a job for boosters initially, and that inevitable, fatal slowness was the final wall of the trap in which Turner had caught them. But—

"Phase?" Harding suggested.

"That's the only out," Mayall said flatly.

"It'll take a good Team."

"I've got one."

Harding was silent, turning over possibilities in his mind, marking time briskly as the dusty way glided under his feet. Tension was tightening in him. He wanted to start running. But he was trapped in a squirrel-cage helplessness that kept him immobilized while Mayall hatched schemes with his mysterious Team in Round Table session. Who could guess what murky plans moved in that strange, unstable mind?

The visual mirage around Harding was perfect. So perfect the impulse to test the nearest tree with a questing finger was almost irresistible. Was he really indoors? Halfway he disbelieved it. Only the ghostly silence of the world he walked through attested to its unreality.

The fringes of the village slipped away behind him. Now he was climbing the first hill, remembering to bend forward a little as the ground seemed to rise steeply before him. The domed relay station where Turner waited dropped below the hilltop and vanished for a moment. Until he reached the rise of ground ahead, he would be hidden from Turner. But that did no good. If he didn't reappear on schedule at the hilltop, Turner would certainly suspect a trick. And if he did suspect, he was very likely to act. A man with a bullet through his wrist is apt to be impulsive.

The spaceship would blow, and the island with it. Or at least, a good part of the surface of the island, along with whatever life forms happened to be there at the time.

Phase. Phase was the answer.

Harding kept walking automatically across the grassy rise, tilting his body forward to compensate for the slant. No, he needn't bother yet with that. Turner couldn't see him. He stopped walking. There was no need. Eerily, the landscape still moved backward around him at a walking pace. Once, a little while ago, he had crossed this island's hills and talked to its trees, hearing the leaves reply in Mayall's bitter voice. Now he glided in utter silence over the hills. It was a magic island, in its way. An island where sight was the least reliable of the senses.

He looked ahead, deep into the illusion, estimating the distance to the rise. The landscape flowed by around him. Tentatively he reached for the curtains upon which all this unreality unrolled itself. His hand touched woven metal, invisible in midair. He waited, listening. No sound came from Mayall. If he were really able to see into the cubicle, he was not looking now. He sat at his Round Table, facing the Composite Image of his Team—

Moving swiftly, Harding stepped backward on the gliding path and slipped out between the curtains of sunny air. The shadowy control room lurched violently underfoot as the slanting hillside seemed to give place to level floor. On the wall, visible at an angle, the TV screen from which Turner had spoken still showed a foreshortened and flattened relay chamber, and Turner's broad back leaning toward the window that opened in its far wall.

Turner's hand was on the lever. He was stretching to watch the village, the path along which Harding's illusion moved leisurely. His intentness as he stared at the hilltop was so compelling that Harding himself could not be sure his own image would not in the next moment come strolling into view.

Soundlessly, hugging the wall to stay outside the TV screen's range in case Turner should glance back, he slid toward the door of the Round Table room. It was closed. Quietly he laid his hand flat on the lock plate. The vibrations rippled softly under his palm, but he did not manipulate the code of the lock. He put his ear to the panels instead, listening. He could hear only an inarticulate murmuring from inside.

He dared not interrupt.

Absolute concentration would be necessary to work out the phase method that could counter Turner's threat. Phase. He had used it himself, getting through the barriers around the island. But this was a more precarious matter—the sending out of a frequency from another relay station that could cancel Turner's was easy enough, but timing was another matter. When the UHF started slipping down the spectrum, the other frequency would have to slip down too, at exactly the same pace, so that the phase cancellation would operate while Turner's beam passed through the dangerous hot band which would explode the ship's

fuel unless the controller beam nullified it.

Only an Integration Team was capable of the enormous concentration that could insure perfect coordination with Turner. It called for faster than instant perception and reactivity. And Harding thought it extremely doubtful whether many Integrator teams could manage it. Only the best, the ones who had worked together for years, developing a Composite Image that was an absolute projection and synthesis—and what was Mayall's Team like?

Turner in the TV screen shifted his feet noisily on the floor, exhaled an impatient breath. Harding glanced up, alarmed. Clearly it was time for his projected image to come over the top of the hill. Past time, perhaps. Turner's hand was quivering on the lever already.

Harding flattened himself to the wall once more and slid back rapidly toward his cubicle. Just before he ducked inside he measured the distance between the probable inner wall of the Round Table room and the room where the metal curtains hung. They were side by side, sharing a single wall. Bullets would pierce that wall—

There was no time to waste now. Harding slipped between mesh hangings that swayed like the curtains of reality, blue sky and green grass shivering, warping space, settling again into the illusion of a solid world. The ground glided past fluidly under him. Bending forward as if against a steep slope, Harding began to mark time again as the top of the hill slid level with his feet.

He began to descend the hill. Now he could see the domed building again, and the lake below. He thought of Turner, a white shape dimly visible at a window under the dome, letting out a loud wheeze of relief as his image came into view. The disorienting sense of doubled projections everywhere made Harding's head swim when he tried to think.

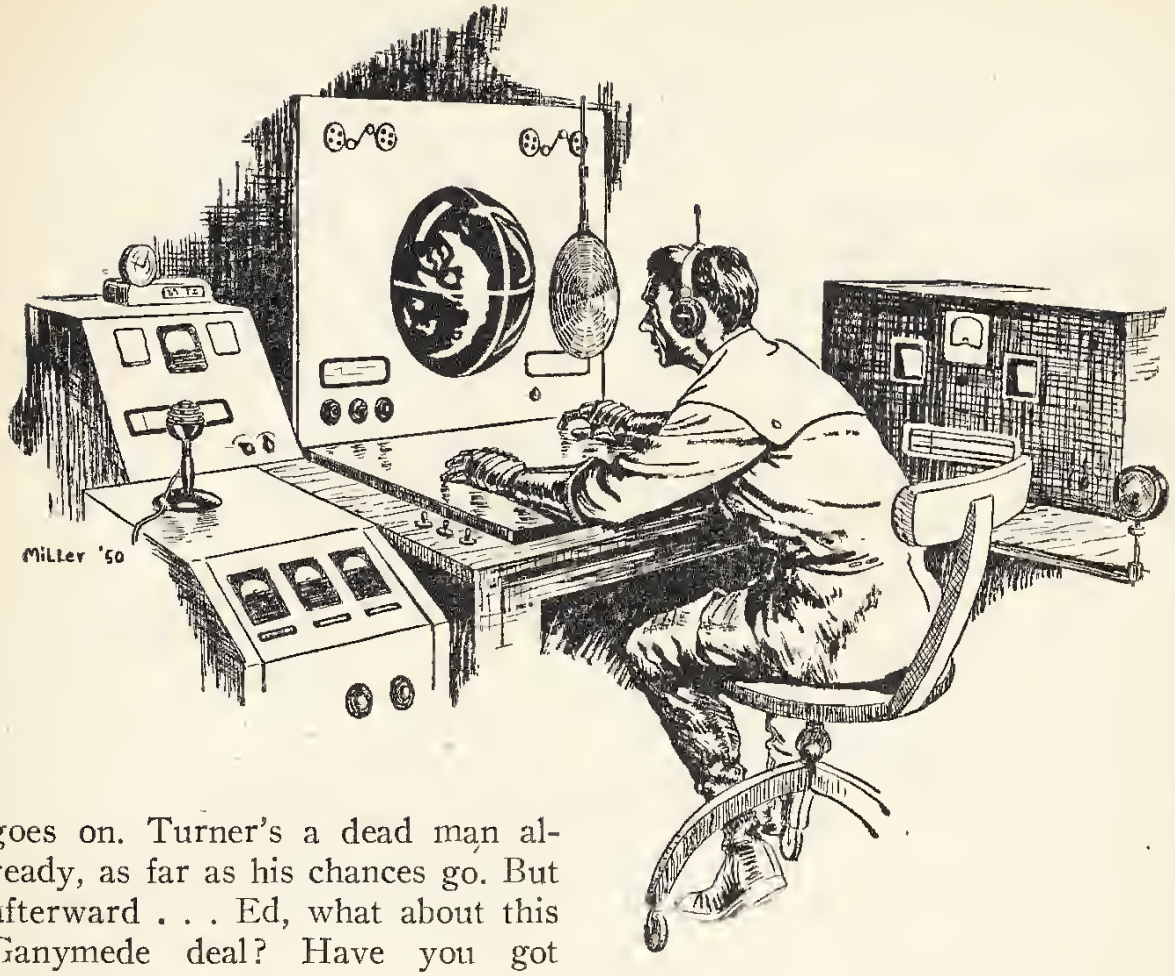
"Harding?" The blue lake seemed to speak in Mayall's voice as Harding's path carried him smoothly down toward the shore. "Everything all right?"

"So far," Harding said, moving his feet dutifully as the path skirted the water's edge. "How are you doing?"

"I think we're getting it," Mayall said, apparently out of the rushes around which soundless water lapped.

"You'd better," Harding said, thinking grimly that if they didn't, this ghost of himself might go on gliding for years to come over the desolate island, always supposing the projective equipment survived, by some miracle. Or no—no, the man himself had to stand here before the ghost could walk.

"Harding," the rushes said, half hesitantly, "we've got a few minutes. I want to talk to you. Suppose we succeed. I've got a paralysis beam set up on Turner now. The moment we cancel his hot sonic, the paralysis



goes on. Turner's a dead man already, as far as his chances go. But afterward . . . Ed, what about this Ganymede deal? Have you got *proof?"*

Harding chuckled.

"Do you take me for a fool? Once Turner dies, do you think I don't know the next question you'll put to your Team? *'How can I force myself to kill Harding?'* Maybe it's set up already, just waiting until they're free. They'll give you an answer, too —if we survive. If they're good enough to cancel Turner's beam, they'll be good enough to tell you how to get rid of me. If I die, George, you'll never know the truth about Ganymede."

The rushes were silent. The whole ghostly world was silent, for the distance of a dozen paces. Harding trudged on around the edge of the phantom lake under a phantom of sunlit sky. At the top of the next rise stood the phantom of a domed building where a phantom Turner waited to recognize a phantom.

"Ed, tell me the truth," a phantom of Mayall's voice said out of air. "Are you from the Ganymedans?"

"Why not ask your Team?" Harding mocked him. "Maybe I was lying. Maybe I'm just a washed-out Team member trying to muscle in on your racket."

"Or maybe you *weren't* washed-out," Mayall said. "Maybe the Team sent you to stop me, because they

couldn't stop me any other way."

"That would be a joke, wouldn't it?" Harding said, chuckling. "Building up Integrators and Teams to such a pitch of complexity they cancel each other, and we have to go right back to the old prehistory days of man against man, unarmed—without even weapons against each other, George! Because we can't hurt each other with *any* weapons. Yes, that would be very funny—if it were true."

"Is it true?"

"Ask your Team," Harding said again cheerfully. "There's another possibility you may not have thought about. What if Venus sent me, George?"

"Venus?" Mayall echoed in a startled voice.

"They might have. They may have been waiting and watching for just such a man as me, George. They snapped you up when you were bounced off the Team. O.K. Maybe they snapped me up, too. I've never *said* I wasn't approached, have I?"

"But why?" Mayall's voice was bewildered.

"Lots of reasons. Maybe they were curious to know if you'd sell them out when a better offer came along." Harding chuckled again. "Well, they'd know the answer to that, wouldn't they, once I got in touch with *my* backers again?"

"You won't leave this island," the green hillslope said grimly. "Ever."

"One of us won't. That's sure. But maybe you'll be the boy who stays. Do you really wonder why Venus might want you kicked off this Team too, George? Maybe for the same reason Twelve-Wye-Lambda had to. What disqualified you for one Team might disqualify you for another. Might? It would!"

"There's no reason—" Mayall sounded a little choked.

"There's every reason. Why is it Venus hasn't made any offensive moves against Earth for . . . how long has it been now? . . . six months? Eight? All Venus does is counter Earth's aggressions—successfully, but defensively. Only defensively. Things are settling down to a *status quo*—another Hundred Years War. I wonder why?"

"Why?" Mayall asked harshly.

"Because the top brass always hates for a war to end. And you're top brass as long as Venus depends on your Integrator. Why, you've put up such defenses yourself nobody could get in to stop you, until I came along. Maybe for a long time now your backers have wanted to change things on Akassi. But how could they? They've set up a Frankenstein's monster.

"Did you pick out an incompetent Team on purpose, George? One you could boss around the way you bossed Twelve-Wye-Lambda until I came along? Or have you got 'em drugged or hypnotized? It looks like a draw between Earth and Venus, infinitely prolonged, because Earth's

too vitiated to expand and reconquer, and Venus just isn't asking any questions.

"That's what wins any fight, George—asking questions. That's what progress and growth is. Not answering questions so much as asking 'em. And it's the one thing a thinking-machine can't do."

"I suppose you know all the answers, Ed," Mayall said coldly. "I suppose—"

"Nobody knows all the answers. Nobody can. The only way a machine could know them all would be to draw a circle and destroy everything outside it, everything it couldn't handle. And that's what you're doing, George. You're not *using* your Team or your Integrator or yourself. The one thing nobody wants is *status quo* right now. Only a machine's at optimum at *status quo*— and you're a *status quo* man from away back, George. It's why they threw you off our Team. It's why Venus *might* have sent me to Akassi."

The landscape unrolled silently when Harding's voice ceased. Mayall said nothing. The lake wheeled away behind and the pathway, straightening itself ahead, swung the whole island around with it until the domed station where Turner sat waiting lay directly before Harding, at the top of the nearing hill.

He grew tense as the time drew out and still Mayall did not speak. What was happening behind that illusory veil upon which the world reflected itself? Whatever was happening, it couldn't go on much longer. Already Harding could see the thick white shape of Turner leaning at the window eagerly, watching him—watching his illusion—toil up the steep hillside toward the dome.

Something was going on. In the square, small room on the other side of the wall, where Mayall sat at a table before a tri-di screen, something was certainly moving to a climax. It had to. Because in another two or three minutes Harding was going to reach the door of the relay station—no, not Harding, but Harding's phantom. Just how convincing it looked Harding had no way to guess, but sooner or later the limits of illusion would have to be reached, and then—

Then Turner would pull the lever and the whole game would be canceled on Akassi.

Now Turner was leaning over the windowsill, waving to the oncoming ghost. Harding could see his quivering, fat face with the blood streaks on it. He saw the mouth open and knew Turner must be shouting to him. But since this illusion of Akassi was silent, he didn't know what Turner was saying. It might be a command to halt. It might be an invitation to come in. It might be a question upon whose answer all the lives on Akassi depended. But he could not answer if he could not hear.

He said, "George!" in an urgent

undertone, pitching his voice low because of the irrational feeling that Turner *must* hear him if he spoke aloud. He was so near now—he was looking up at the fat man in the window from so close he could see the sweat beading the heavy face. The closed door of the relay station rose up within a hundred feet of him, and he was nearing it with every step.

When he got there, what would happen? His hand was solid and the door *looked* solid, but the width of the island lay between them, and once the unreeling illusion swept him irresistibly into contact with the door, Turner would see the truth.

"George!" Harding said again, his eyes meeting Turner's eyes.

From the other side of the illusion, he heard the hillside laugh—

It was Mayall's voice, and it did not speak a word, but the laughter was a freezing sound.

Between one step and the next, Harding knew the truth.

He stopped dead still, stunned for an instant by the knowledge of what was happening in the black steel room—what had already happened, while he plodded blind and lost through the mirage.

He should have known when Mayall first spoke a few moments ago, after the long silence of concentration upon the Composite Image and its problem. Mayall would not have broken silence *before* the problem was solved.

That meant the Team already knew its answer to the question of Turner. And that meant the Team was free to give Mayall the second answer upon which his life depended. He must already have asked that final question, and the Integrator must be answering it in this very moment. *"How can I kill Ed Harding?"*

No wonder the hillside laughed at him.

Smoothly the pathway swept backward beneath his unmoving feet. Smoothly the ghost of the domed building glided toward him. At its window Turner leaned, staring down anxiously. Harding made his feet move, striving for illusion to the last. For the fat man's hand quivered on the lever. He sensed something wrong, though he did not yet see what.

"George!" Harding said desperately, putting up a hand to hide his mouth so that Turner would not realize the ghost's lips moved soundlessly. "Look, George! I'm almost there. Are you watching?"

The hillside laughed again, the same chilling sound.

Of course Mayall would make no move—yet. There were still several seconds left, and as long as Turner stayed alive, Harding was trapped in his little treadmill of mirage. He dared not break the il-

lusion while Turner could still be held by the last slow-running moments of it. But while Harding plodded in his trap the Integrator gave Mayall the answer that was all he needed to extinguish Harding forever.

"George!" Harding shouted suddenly and desperately. "George, look!" And with frantic resolution he snatched the revolver out of its holster at his side.

The hillside gave its freezing laugh again. "You can't shoot me," Akassi said to Harding. "All I need is half a minute more, and—"

"I'm not trying to shoot you," Harding said, taking careful aim. "George, if you aren't watching we're all dead! George—I'm going to fire at Turner!"

The ghost of Turner shouted soundlessly in its window just over Harding's head. To that ghost, the man and the gun below looked desperately real. Turner lurched backward clumsily, mouthing shouts that made no sound.

The fat hand tightened on the lever.

The lever moved.

"George!"

"All right!" Mayall snarled from the other side of the hill. The air began to fill with a strange, thin singing sound too far above the threshold of hearings to impinge except as a stinging and tickling in the ears.

But Harding knew what it was. The Team and the Integrator, working as one tight-welded unit, was bending every iota of their blending efforts to cancel Turner's UHF as it slid down the spectrum toward explosion. It would take full concentration from Mayall and his Team and his Integrator—for a few seconds.

In those few seconds, Harding had to act.

He thought, *If I can ever kill him, the time is now!*

He saw through the window just above him the deadly lever dropping under Turner's hand. While the united Team rode the beam downward invisibly Harding was safe—and only that long. Then their full concentrated attention would go back to the problem of Harding's death.

The mirage was vividly real before him—but he knew it for a mirage. He knew that where open hills and a lime-green sea seemed to stretch before him in the sun there was really only a mesh curtain, and beyond that a steel wall which bullets could pierce, and beyond that—George Mayall.

He swung his gun around toward the spot on the wall where he knew Mayall would be sitting. Even if Mayall were watching him now, he couldn't move from that spot. He had to focus his full attention upon the screen and the Integrator. If Harding *could* fire, then the game was his.

If he could fire.

Until this moment he had not consciously tried to kill Mayall. He knew the strength of the compulsion that forbade him to shoot, and he had not wanted to build up defeat-patterns until he made his final effort. But it was now or never.

He thought, *I can fire a gun at nothing. And there's nothing in front of me. Nothing but empty air. The bullet will clear the corner of the relay station and go out over that hill and drop into the ocean when it's spent. There is no mesh in front of me. There is no wall. There is no George Mayall. I'm shooting into midair—*

The revolver was a part of himself, an extension of his outstretched arm. The new synapse waited to be bridged between the crook of his finger and the smooth, cool trigger it pressed. He *was* the gun.

The gun responded as his arm responded to conditioned reflex. The gun felt pain.

Sensory hallucination is an old story. The gun had symbiotic life that was one with the gunner's, and how real is psychogenic pain? Harding knew this sharp, increasing burn was purely imaginary. But it hurt. Moving backward from the muzzle, the pain burned through the steel and the hand, up his arm, contracting the muscles until the pistol wavered. He was suddenly frightened. The symbiosis was terrifyingly complete. *Could he let go when the time came?*

He made one desperate, determined effort to squeeze the trigger. And all his muscles locked. For an instant absolute rigidity held him. And for that instant he fought hard against the frightening illusion that the awareness he had projected into the gun had been seized by the gun. The tool seized the man, merged with him, might never let him go.

Then every muscle from the shoulder down went limp. The arm dropped helpless to his side. He couldn't do it. He couldn't shoot Mayall. He was conscious at the moment only of relief.

Above him in the window he saw Turner at the lever go suddenly rigid. Paralysis had struck him motionless in the middle of a gesture as the Team moved in. He saw the back of the man's thick neck go red with congestion as the breath stopped in his frozen lungs. That meant the UHF was now dropping and the Team with it, in full, fast action. Within the next few seconds they would succeed—or fail. If they failed, probably Harding would never know it. If they succeeded, then Mayall would get his answer to that other question in a matter of minutes.

There might still be one chance for Harding. If he could hear the answer—

His rebellious arm was perfectly obedient when he sent the impulse downward to holster the gun. Rub-

bing the numbness from his muscles, he whirled in the illusion of the sunshine and tore the universe apart like a painted veil.

Blue air and lime-colored sea separated to let him through.

On the wall of the control room the TV screen showed Turner still rigid, back to the screen, his neck purple now. He was probably quite dead already.

Walking fast, Harding crossed the room, laid his hand on the lock plate of the inner door. He watched the door slide open.

Then he stepped into the little, dark-walled metal room, and the conflict ended as it had begun, with an image on a screen.

Mayall sat with his back to the door, leaning forward over the table, his hands flat on the plate. He was staring hard at the tri-di screen, and out of it the Composite Image of himself and his tools looked back.

It was beautiful and terrible—and the answer.

It was something Harding could not believe, and yet it came as no surprise, for given George Mayall as Harding knew him, what other answer could there have been but this?

The Integration Team was complete—seven thinking brains and the Integrator. But George Mayall was the only human being on the Team. The Composite Image glittering before him on the screen blended his outlines and theirs, merged his mind with their minds. But the six minds that met with Mayall at the Round Table on Akassi were machines. And Harding knew vividly the danger of machines.

Six mechanical brains, stored with knowledge out of human brains. But not humans themselves. Not beings who could ask questions or demand accountings from the one living human on the Team.

No one man had ever before controlled an Integrator singlehanded, single-minded. No one man had ever dared try. And no sane man could do it. George Mayall had tried, and in his way succeeded. But his success was a failure more terrifying than any defeat could be.

Perhaps the most terrible thing of all was his attempt to create a Round Table with his seven mechanical storehouses of human knowledge. It would have been bad enough had he simply stored the knowledge away on tapes and drums. Even then it would be fearfully dangerous to draw upon it blindfolded, as he had to, because one man's mind can hold only so much, and it takes seven minds at least to balance an Integrator. Not seven storage drums of recorded fact, but seven human minds, alive, active, perpetually posing questions and arriving at flexible decisions as no mechanical brain has ever yet learned to do.

The mechanical brain *must* be balanced by human minds, or spin out of control. Or else it must draw a circle at the limits of arbitrary

control, and destroy all growth outside the circle.

Out of the tri-di screen an Image looked back at Harding which made his mind go numb. It was the most beautiful thing he had ever seen. He hated it more than anything he had ever seen.

The Image had no face, and it had no eyes. But Mayall's burning black gaze looked out of it—somehow, impossibly—blended with the glittering masks of the machines in a synthesis so perfect no watcher could decode that total linkage. Seven component parts made up the Image. It glittered, it was smooth and shining, its fine, functional lines and perfect proportions made it a thing of unthinkable beauty. But you could not separate what of that Image was human and what was machine. The steel was one part flesh, the flesh six parts steel.

A man cannot blend and merge with machines and remain sane. Nor should the machine look back at its watcher out of human eyes, with rage and terror showing in lines of passionless steel. If it were possible for a machine to be mad from too close a contact with humanity, then these machines were mad as the man who had forced them into the impossible unity of the Composite Image.

But the machines had their revenge. They had seized the man—

It was this Image which guided the lives and fortunes of sixty-one thousand humans upon Venus, and threatened the Solar Empire.

Out of the Composite Image George Mayall looked despairingly at Harding, trapped and desperate in his inchoate prison of steel. The man in the flesh sat three feet away from Harding, but the man in the Image was the real George Mayall. And Mayall *was* the machine—

Drowned, lost, hopeless in the steely beauty of the Image, Mayall's face looked back at Harding out of the bright, burning, multiple mask of the machines. There was helpless terror in the look, and a desperate appeal.

For Mayall had set up upon Akassi too strong a Team. He had laid out his defenses too well. And no one could break through to rescue him from the monster he had made and merged with. Mayall was the ultimate secessionist. He had seceded from the race of man.

Not now or ever could Harding allow himself to injure a man who had once shared a Composite Image with him. But he lifted his revolver with a steady hand. It was no injury he was about to do Mayall now. Not any more. The time was long gone when death would be injury to George Mayall.

"I meant to tell you, George," Harding said to the Image in the screen, "why I'm here and who sent me. But it doesn't matter now, does it?" He centered the pistol upon the

back of Mayall's head in the chair before him. *That* wasn't Mayall any more. Harding spoke only to the composite thing in the screen. "It makes no difference at all who sent me. It only matters that I'm here, and that I should win. And that you should die, George. This was what you wanted, wasn't it?"

He *was* the gun. The trigger pressed backward of its own accord.

On the screen, steel suddenly shattered outward and blood gushed over the hard, bright face of the metal Image and spread down the metal breast.

The screen began to dim. The fading face upon it was all steel now.

When the last trace of humanity melted from the metal, and the last trace of the Image from the screen, Harding put his gun back in the holster. He had been in time, then. Mayall was merely the first.

He closed his mind to that terrifying thought, that inevitable possibility. It might not happen. It might never happen, as long as men were willing to accept defeat rather than win conquests at a cost which all mankind must pay.

Man is a rational animal that can ask questions, and fail, and go on again from failure. But Mayall had come close to creating a machine which could not fail. It could maintain an optimum—an eternal, functional, inhuman optimum, guarding its charmed circle with perfectly adaptive defense against all attacks from men—as long as men lasted.

No, surely it was impossible. That blinding, beautiful foreshadowing upon the screen had been a promise and a threat, but fulfillment must never happen. Now or ever. Harding would have a job of destruction to do—dismantling of the robots, so the Integrator might function normally, harnessed and guided by a human Team which he could get from . . . no, that didn't matter. All that mattered was this.

Harding lifted his hand and touched his forehead gently. There the real Integrator lay. Once, a very long time ago, pre-men in the days of their unreason carried under their skulls brain-mechanisms of potentially great capacity. But at first they did not use them. Not until—something unknown—happened, and the flame of reason kindled in the waiting Integrator of the human brain. *Homo sapiens—*

Machina—?

Harding shook his head angrily. He turned toward the door, but on the threshold he paused to look back once, doubtfully, at the empty screen that was like a closed door on the wall.

THE END

PRIVATE ENTERPRISE

BY EDWIN JAMES

The problem of an intelligence agent among an inhuman race is tough; he can't pass for the aliens. But what bothered him was why the alien should be trusted so fully by the human Intelligence Service . . .

Illustrated by Miller

The knocking began at exactly 17:53 Earth time, 27:36 Rigel V. Bill Stewart noted it, since he was in the act of setting his wrist watch which compared Earth hour, day, month, and year with that of Rigel V.

The taps on the door began in a commonplace way but quickly became peremptory. Stewart felt a shiver of apprehension as he walked toward the viewer. It had come at last.

He flipped the switch. The figures and faces of the three Rigelians which sprang into view were almost human. They were not in uniform, and the expressions were pleasant by Earth standards. Earth standards, however, did not hold true on Rigel V.

The thought triggered a memory cell and a fragment of training flooded into his mind. The expressions were—official. Not police. Government investigators. Secret, probably.

The hammering on the door continued. Stewart clicked off the viewer and walked quickly to the communicator. Unhurriedly, without wasted motions, he turned it on, reached behind the set and twisted another switch.

The screen blurred, became shot with crooked shapes, and cleared into recognizable images. The image of a Rigelian appeared on the screen.

"Z," Stewart said. "Plan H-30."

The native nodded. A loud crash came from the door as if a body had been hurled against it. Stewart

switched off the communicator, reached behind the set and pulled, sharply.

His hand came away holding a small box from which trailed several short wires. Stewart walked swiftly to the kitchen. He pressed a button on the box and tossed it into the incinerator chute.

The crashes against the door threatened momentarily to break through. Stewart went to it quietly and slid back the bolt. He stepped back in surprise as the door banged open and a Rigelian blundered into the room. The other two followed quickly.

"Yes?" Stewart said in astonishment.

The Rigelians faced him uncertainly. Then one of them regained his composure and stepped forward.

"William Stewart?" he asked.

"Yes?" Stewart said, his voice still holding a question.

The leader flashed an identification card. They were secret investigators, all right.

"Your passport," the leader said crisply.

Stewart fished it out of his wallet. The investigator glanced at it.

"Native planet: Sol III. Purpose on Rigel V: trade," he read aloud.

He snapped it closed and slipped it into a small leather case. Stewart was about to protest and thought better of it. The other two investigators immediately began to search the apartment.

"What is the meaning of this?" Stewart asked.

"We will ask the questions," the leader said. "You are in the export business?"

"Yes," Stewart said.

"To what places do you export?"

"To the Nine System Trade Alliance," Stewart said.

"Specifically?"

"Sol III."

The investigator nodded slowly and then snapped out a question.

"How much did you export last year?"

"The legal maximum," Stewart replied quickly, and added dryly, "which wasn't much."

The Rigelian's eyelid, a grayish film, slid part way over his eye.

"Do you mean to imply by that remark a criticism of the government?"

"Of course not," Stewart said, and cursed himself silently.

"It will be placed in the record, nevertheless."

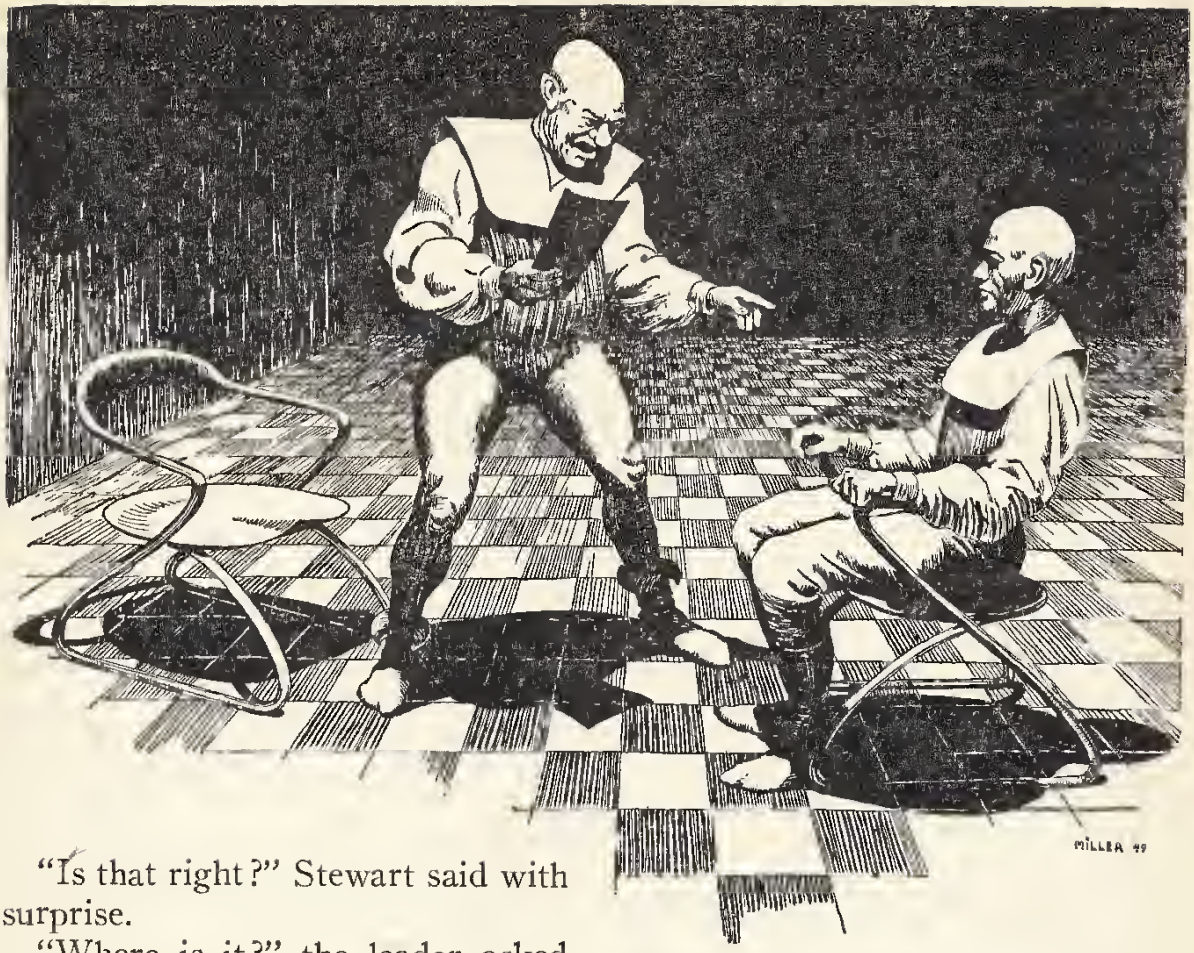
The searcher who had been roaming around the apartment tapping the walls, the floors, looking behind ornaments, pictures, cushions, came back and shrugged.

"There isn't a thing here," he growled.

The other was investigating the communicator now. Stewart watched him out of the corner of his eye. The native looked up.

"This thing is wired for a scrambler. There's space for one, but there's none here."

The leader turned to Stewart.



"Is that right?" Stewart said with surprise.

"Where is it?" the leader asked coldly.

"I don't know what you're talking about."

"The scrambler," he said impatiently, "what did you do with it?"

"This is foolish," Stewart said angrily. "I don't have a scrambler. I've never had one. If the communicator is wired for one, I never knew it. It must be an accident."

He started as a knock came at the door. The leader opened it, and another Rigelian came in, carrying a pail filled with water.

"This dropped into the incinerator," he said.

The leader reached into the pail and pulled out a blob of metal.

"It was molten when it got to me," the newcomer said.

The leader eyed Stewart for a moment and then dropped the featureless lump of metal back into the water.

"It might have come from anywhere," Stewart shrugged.

The leader was silent for a moment.

"What calls have you made in the last hour?" he asked finally.

Stewart thought for a moment.

"None," he said, and a subtle change of expression on the Rigelian's face warned him. "Except," he added quickly, "I tried to call my office a few minutes ago but there

was some kind of interference."

The leader sighed.

"Very smart, Stewart."

"I don't know what you're talking about," Stewart said stiffly.

The leader sighed again.

"Come along," he said.

The four of them grouped around Stewart.

"Where?" he asked in alarm.

"We'll tell you when we get there," the leader said wearily.

"I demand that the Sol III consular office be notified," Stewart said indignantly.

"You are not in a position to demand anything," the leader said.

They urged him toward the door.

"I object to this infringement of my rights as defined under your Agreement and by treaty between Sol III and Rigel V," Stewart said.

"Your objection is noted."

Stewart's mind raced. They didn't have anything against him but suspicions, he knew. No proof that would stand up in a court. But he could be made to talk. There were ways. And a few words would be enough to ruin everything.

He was suddenly conscious of a lump in his throat. It was not emotion. One odd word would shatter it and an almost instantaneous poison would flood his system. It might come to that.

It was up to Calr Mtar. But why should Calr betray his people, his planet?

Stewart suspected, as he had suspected all along, that Calr was playing along to feather his own nest, that when the time came he would slyly betray the plan and retire, incredibly wealthy. Calr didn't have to worry. His tracks were well covered.

Stewart shrugged.

"This is all a big mistake," he said. "You can't hold me for long."

That was true enough, he thought wryly.

The room was not exactly in the classic tradition. It was fairly large and softly lit, but something in the color scheme or decorations seemed to plead for confession and repentance.

They were clever. They had searched him, X-rayed him, and found nothing, it is true. But they were clever. Stewart steeled himself against the soft-voiced questions.

"With what company are you connected in your export business?" asked the investigator who had taken charge at his apartment.

"None," Stewart said in a flat, dead voice. "I am independent."

"No agreements of any kind with any other businesses?"

"No," Stewart said.

"How many persons do you employ?"

"Twenty-eight," Stewart said. "All Rigelians."

"How much was your net for the last year?"

"Fifteen thousand credits."

The questions droned on and on,

investigating the structure of his business, his reasons for coming to Rigel V, his reasons for staying. His living expenses, his bank account, what were his future plans? Was he planning on leaving soon?

Stewart sat up a little straighter.

"I object to the whole nature of this inquisition and its apparent object—to force me to leave Rigel V. Everything about this is contrary to all the laws of the galaxy and Rigel V. I shall make a public complaint as soon as I am freed from this illegal imprisonment."

The investigator shrugged.

"That is your privilege. What associates do you have in your business?"

"None," Stewart said sullenly.

"What interests do you have in other businesses?"

"None," Stewart said.

"None?" the investigator echoed in astonishment.

"A few shares of stock," Stewart shrugged. He named them; they were in minor Rigel enterprises.

"Have you ever speculated on the stock market?"

"Yes," Stewart said.

The investigator became alert. Stewart smiled inwardly.

"When?"

Stewart gave him the dates.

"Stocks?" the investigator asked.

Stewart named them.

"What was the result?"

"I lost about five thousand credits," Stewart said dryly.

The investigator looked disappointed. He probed deeper into Stewart's stock market escapade and looked even more disappointed. He questioned him about his taxes, his tariff payments, his export license, and the filing of government information blanks.

"What do you export?" he asked.

"Luxury items," Stewart said. "Unrestricted finished machinery of light weight and exclusive design, gems."

"And what do you import?"

"A few luxury items on order," Stewart said. "Chiefly for the Sol III colony."

"Write down a list of your friends and acquaintances on Rigel V," the investigator said and handed him a pencil and a piece of paper.

Stewart hesitated for a moment and then looked up.

"This is uncalled for—" he began.

"I know," the investigator said. "You object. Go ahead."

Stewart began to jot down names.

"Natives of Rigel V as well," the investigator said.

In a few moments Stewart was finished. The investigator scanned the list.

He queried him about a Rigelian of great wealth and power who was not included. Truthfully, Stewart denied knowing him. The next question was about Calr Mtar. In the same tone Stewart denied any acquaintance. The investigator went on down what must have been a list of Rigel V's richest men and ended baffled.

"Who have you used as an agent for your trickery?" he blurted out.

Stewart looked up in surprise.

"I don't know what you mean," he said.

The investigator recovered himself quickly.

"You realize, of course," he said, in a quiet tone that did not conceal the subtle menace of his voice, "that we can force this information from you."

Stewart jumped up angrily.

"You wouldn't dare try anything like that. It would be an offense against the dignity of Sol III and might well lead to war."

"Sit down," the investigator said firmly. "Who would ever know? And who, knowing, would ever dare tell? And, if you are as innocent as you keep protesting," he added slyly, "you would have had no idea we would be calling on you."

Stewart sat down. They had him there. He couldn't say he had left a warning to suspect Rigel V's secret investigators if he were missing.

"Of course not," Stewart said with irritation.

"Have you ever done any of your business through an intermediary?" the investigator went on.

"No," Stewart said wearily.

"Has anyone ever bought any stocks for you under their name?"

No. No. Stewart said the word again and again until it became meaningless, an improbable sound he had to force his lips to shape.

They kept pounding away at him. The chief investigator would retire for a moment and another would take his place with the same questions, the same insinuations. Relentlessly they went over the same ground again and again.

They wanted the exact details of his business; how many times had he repeated the figures?

Did he have any interests in other businesses? What about the stock market? Again and again. Denial after denial. No. No.

Where did you get the money to enter business?

"Eh?" Stewart said, half-drawing himself out of his stupor.

"Where did you get the money to enter business?"

It was something new; they had got around to that.

"From my grandmother," Stewart said.

"Grandmother?"

"She left me one hundred and fifteen thousand credits when she died."

They absorbed that. They would check on it. Let them check. The questions droned on and on, a spiteful buzzing through which Stewart slipped farther and farther away.

Poor grandmother. If she had known what use would be made of her treasured inheritance. A comfortable sum, she always said, a comfortable sum.

"A comfortable sum indeed," the chief said, the day after he was graduated from the School—the

school that had no name and no official recognition.

The chief sat behind the big polished desk in the luxuriously furnished room without windows. He placed his fingertips together in that characteristic way of his.

"That is one of the reasons you have been chosen for this job," the chief went on. "We could supply you with a documented inheritance, of course, but we prefer it this way. The Rigelians are a suspicious, clever race, as you know."

Stewart nodded. He had spent eighteen exhausting months studying Rigelian psychology, history, economics, sociology, philosophy—the list was almost endless. He knew Rigel V as he had never known Earth.

"It is not enough to be successful at a job in this service," the chief said slowly. "One must be successful—and unsuspected."

Stewart cleared his throat.

"A difficult task," he said.

The chief eyed him keenly.

"Of course," he said. "That's why our requirements are so exacting. It's more difficult than being a spy. A spy can operate undercover, but you must act in the open."

"What is my business to be?" Stewart asked.

The chief inspected his file.

"The export business. Rigel V has just lifted its ban on exports, although they are still limited to a small figure. Imports are restricted to practically nothing."

"What kind of businessman am I to be?" Stewart asked.

The chief smiled.

"That's the kind of question I like to hear. A smart operator could probably make thirty thousand. You could clear forty-five thousand or more. But, through various small errors of judgment, you will restrict yourself to twenty thousand or less."

Stewart nodded. That much was obvious. The chief went on to discuss the details of the business arrangements, the places to which he should export, what his exports should be.

"The crux of this business front is that everything must be open and aboveboard," the chief summed up. "There must be no connection between this and your other activities.

"Your character must be that of an eager young businessman, slowly building a modest fortune, not too bright, not overly interested in anything else. Outside of business you will be a conspicuous pleasure seeker, sociable, gregarious. You will have no time, apparently, for any extra activity."

The character would not be too hard to assume, Stewart thought. With the training he had absorbed in the last three years it would be simple to run an export business with a small segment of his mind. The problem would be to seem completely preoccupied.

"Your living expenses must come

out of your income," the chief said. "But all these things you know. Your training for this kind of work has been as adequate as we could make it."

"I feel—qualified," Stewart said.

The chief nodded.

"Your qualifications are good. That is why you have been chosen for the most difficult job on our agenda."

Stewart looked up.

"That's right," the chief said. "Rigel V is strategically located and violently isolationist. Without it, the Alliance can spread no farther, and the Alliance is in the critical stage of its development. It must continue expanding or crumble."

"And without the Alliance," Stewart said slowly, "the Galaxy would soon be back in the old imperialistic, isolationist rut, a group of jealous blocs, easy prey to the first wave of war hysteria."

"The Alliance is a great ideal," the chief said, his eyes fixed unseeingly in a corner of the room. "It must not be allowed to die."

"My goal then," said Stewart, "is to see that Rigel V joins the Alliance."

The chief's eyes drifted back to Stewart's face. He relaxed.

"Exactly. You must use every means at your disposal to effect that end."

"How will I receive my initial resources?" Stewart asked.

"You will make a bid of one thousand credits for the fuel dross of each ship that brings you freight. Within that dross will be a substantial amount of refined uranium. You will pass that on to your native contact."

"And who will that be?"

"We'll get to that in a minute," the chief said. He cleared his throat. "If caught, you will be the innocent, injured party as long as possible."

"And that will be—" Stewart prompted softly.

"Until they begin to use duress, of one sort or another. And then—"

Stewart swallowed, but the lump remained in his throat. It would always be there, but now it was newly inserted and he was achingly aware of it.

The chief's voice was distant.

"And, if you are caught, you can expect no help from Earth or this organization. The government will have to deny you. You realize that, of course."

Stewart nodded. When he stepped off the spaceship onto the alien soil of Rigel V he would be all alone. His fate, success, or failure would be up to him.

"I have no doubt of your ability," the chief said warmly. "If there had been even a shadow, you would not have been chosen for this job. But," he added dryly, "it is well to be aware of all eventualities."

"I was made aware of them when I entered the School," Stewart said.

The chief's voice was once more businesslike.

"When you arrive on Rigel V,

you will be followed until it is certain that you are not being shadowed. At that time a Rigelian will approach you, call you by name, and say: 'Welcome to the fertile soil of Rigel V'—in Rigelian, of course. You will reply: 'Fertility must be properly cultivated.' "

"And that Rigelian will be?"

"Calr Mtar, known in our records by the code name of 'Carl.' You will trust him implicitly, but yours will be the guiding hand. You will organize a communication system and give detailed instructions on all important activities."

"But a Rigelian!" Stewart protested. "Why should he—?"

"I can't tell you that. It might influence your actions adversely. You must act as if he were an extension of yourself."

"But," Stewart went on, "is he safe?"

"Safe?" the chief repeated, and a smile curled his lips. "Absolutely."

So Calr was safe, Stewart thought dully. The chief had confidence in him. And Stewart had never known the chief to be wrong.

The question returned as it had returned and returned before. Why should Calr betray his own planet—if betrayal it was? How safe was he? A muscle twitched in Stewart's jaw. The next hour or so would tell.

"Why do you always buy the fuel dross of the ships that bring in your freight?"

So they didn't know everything, Stewart thought.

"I make a few credits on the transaction," he said.

"There is some other reason," the inquisitor shouted. "What is it? Tell me?"

Stewart looked at him, a smile in the corners of his lips. Then a door to the room opened, and the smile faded. A gross, incredibly obese figure of a Rigelian waddled into the room, made his way to a chair, and eased his huge bulk into it with a sigh.

The newcomer's expression was pleasant, and the tone of his voice was gentle. But the original investigator to whom he turned his face quivered with fear.

"I should have known better than to leave the conduct of important business to fools," the fat Rigelian rumbled.

The other trembled. Stewart watched the scene with interest. The newcomer, despite his appearance, would be dangerous. He was feared; he must be powerful.

"Leave us alone," the fat one said.

When the door closed behind the other investigators, he turned to Stewart. He sighed heavily and smiled.

"Now, Mr. Stewart," he said heavily, "let us talk."

"What about?" Stewart said warily. "If you have some influence around here, I would like to register a protest against this unwarranted invasion of my rights, this perse—"

"Please, Mr. Stewart," the huge Rigelian interrupted, raising a plump palm. "Let us dispense with pretenses. I said 'let us talk.' I meant let us talk frankly. There is no one to hear us. What is said is just between us. I shall be frank with you; I hope I shall convince you that it is worth while to be frank with me."

"I don't know what you're talking about," Stewart said stiffly. "I have nothing to conceal."

The fat one chuckled.

"Good," he said. "Good. If you will not interrupt me now with outraged protests, I would like to assume some conditions. Everything perfectly hypothetical, you understand."

Stewart shrugged. The Rigelian's voice was soft and confidential.

"Let us suppose that Earthmen are not popular on Rigel V—at least with a considerable, informed minority. This lack of popularity extends to all members of the Nine System Trade Alliance."

"An unreasonable attitude," Stewart said.

"Not if you know the background," the other said, his eyes narrowing. "The Alliance is a tyrannical group, bent on subjecting the Galaxy to its rule, only its weapons are financial instead of physical. Rigel V stands in the way of that domination; it must fight back or be crushed."

The fat one was dangerous. That soft, lulling voice could easily lure him into a confession.

"I had understood," Stewart said coldly, "that the Alliance was run democratically, its only purpose peaceful trade."

"Ah, yes," the other said. "But what of those who do not choose to trade. They are invaded as ruthlessly as if by force of arms."

"Invaded!"

"As you should know," the Rigelian laughed jovially, his rolls of fat bouncing in the chair.

"Is this still hypothetical?" Stewart asked coldly.

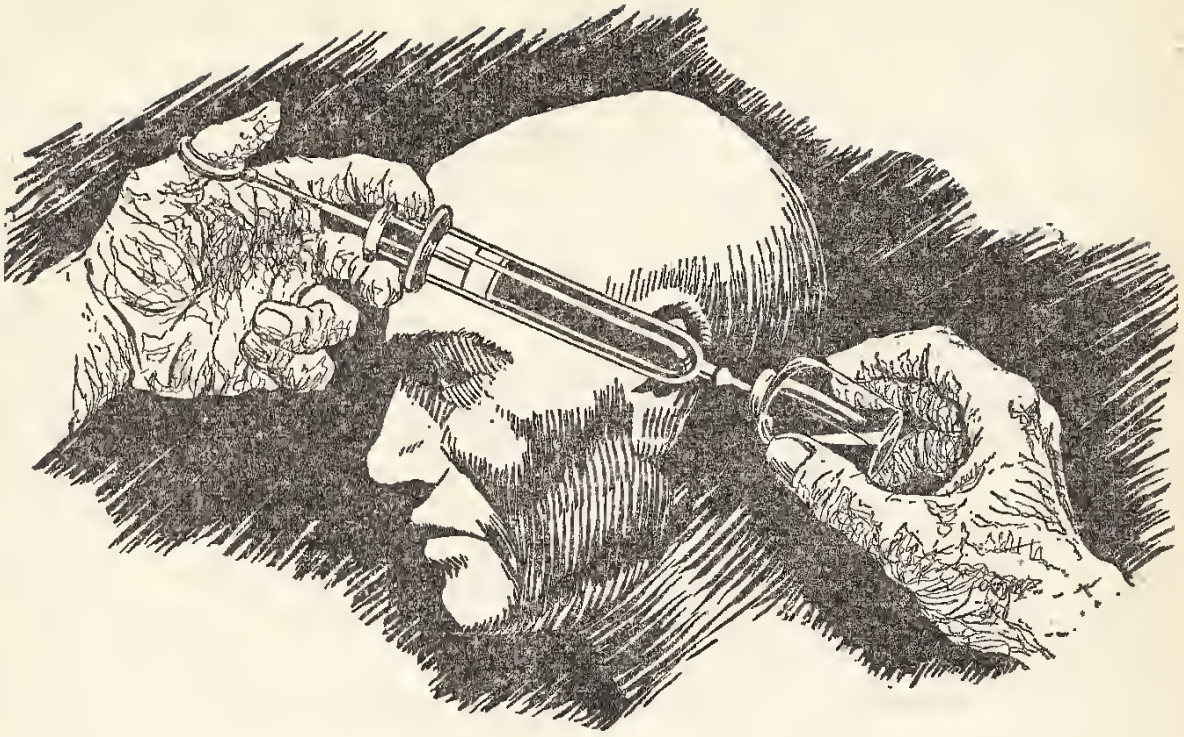
"Of course," the other chuckled. "Let us assume further that on a certain member planet of the Alliance, known hypothetically as Sol III, there is a secret school which has made an exact science of the haphazard art of economics and is engaged in teaching that science to a select group of students."

The fat one stopped and eyed Stewart pleasantly, expectantly.

"I'm listening," Stewart said.

"These students," the inquisitor went on, "are then sent out to recalcitrant planets, ostensibly as independent businessmen, to secure positions of great economic influence which they then use to procure political power. They bring pressure to bear"—the fat one's voice became sinister—"they pave their way with money, they corrupt, they make traitors of half a race."

The Rigelian paused and then



added slowly, "It is not a pretty thing."

"Nor is the sight, I suppose," Stewart said softly, "of a group of men willfully or unwittingly pushing the Galaxy into a dark age of anarchy."

The fat one eyed him keenly and chuckled. "A state of anarchy is when strong men and strong planets come to power."

"Power for good or evil?" Stewart asked.

"Either," said the inquisitor, "depending on how one looks at it. But the fact remains that Rigel V is determined not to join the Alliance. At the moment it stands between the Alliance and the rest of the inhabited Galaxy—a very profitable position, which it would lose if it became a tenth member of the Alliance."

Stewart noticed that the discussion had drifted from the hypothetical.

"But a position which would amount to nothing if the Alliance were to crumble."

"That," the fat Rigelian said shrewdly, "is the Alliance's problem."

He chuckled and the chuckle grew into a roar of laughter. When the noise had subsided, Stewart cleared his throat.

"A problem which Rigel V must soon assume. Without Rigel V the Alliance is stifled. Without the Alliance the Galaxy degenerates to feudal warfare."

Like a snake the fat one struck.

"Then you admit the truth of all

these things. You are an agent of the Alliance, bent on perverting Rigel V to your ends."

Stewart eyed him coldly.

"I admit nothing. The discussion was, I believe, hypothetical."

The Rigelian sighed and sat back.

"You make things very difficult, Stewart. You force me to courses I would not choose of my own free will. We have, you know, a truth serum—"

Stewart looked up. Did the Rigelian read anything in his eyes?

"The serum," the fat one said softly, "is not gentle in its action. It often leaves the faculties of the user sadly impaired, I'm afraid. But—"

He shrugged.

"You wouldn't dare," Stewart whispered. "A private citizen of another planet! You have no proof. It might mean war—"

"We are reasonably certain," the fat one said. "We can afford to gamble."

This was the end, Stewart thought. *Whatever Calr might do would be too late. If Calr was doing anything. Calr . . . Calr—*

"How far have you got?" the Rigelian's voice came thinly, as if from a distance. "How close—?"

Calr—

Stewart had walked a long way through the winding streets of Prayl, capital city of Rigel V, before Calr approached him. Calr had looked like any other Rigelian—better dressed than most, perhaps. He was already rich, but he carried his wealth and position without ostentation.

He had approached straightforwardly, without expression, given the key phrase, and accepted the return. With an almost imperceptible nod of his head he had motioned Stewart to follow and led a tortuous way through side streets and alleys until they were alone in a small, soundproof cellar room.

Calr turned to him.

"I am yours to command," he said simply.

Stewart was blunt. "Why?" he asked.

Calr shrugged.

"That is not important. It is sufficient that we are both working for Sol III of the Alliance and the future of the Galaxy."

Stewart stared for a long moment into the unrevealing eyes of the Rigelian, but he was the first to look away.

"All right," he said, but his misgivings remained.

He made arrangements. From that moment he saw Calr no more than twice in the flesh. But in everything he did the thought of Calr was in the front of his mind, a wonder, a doubt, a fear.

When they plotted by scrambled communicator, Stewart wondered if he were being betrayed. When a raid on the market was about to go through, the thought struck Stew-

art that the whole organization could be wrecked if Calr were a little too greedy.

But months went by, and Calr was faithful in every detail. Gradually Stewart lost his fears and put more trust in his native front.

For the first year Stewart was relatively quiet, building up his export business in a modest way, plotting the course of Rigel V's economic pattern, testing his conclusions through small amounts placed on the stock market by Calr, establishing, memorizing, and destroying plans, building a reputation, doing the hundred and one things that had to be done to set up an organization that was almost self-sufficient—and conceal all evidence of it.

The second year he began operations.

A large working capital had been built up through black-market sales of several shipments of refined uranium, all handled through the subterranean members of the organization. The economic pattern was established. Several trial runs had come off smoothly.

The first killing was made normally enough. Any reasonably astute market operator could have predicted that the market was due for a sudden rise. Several others did. Calr cleared ten million credits.

A few days later, reaction set in, as it was bound to. Calr made about fifteen million on the drop. Again he had company.

Before ten days had passed, Calr bought up the entire impoverished stock of a large company which manufactured power equipment. The next day the World Assembly banned imports of such equipment, and Calr sold out for one hundred million credits profit.

In four months Calr was worth five hundred million credits, in six months, a billion. At that point he began to subdivide. He could get no bigger without arousing suspicion. As it was, all Rigel V hailed him as a new financial genius.

Gradually Calr built up the fortunes of a dozen easily influenced Rigelians. Twice he had to break what he had created before the others became fully impressed that it was better not to have a mind of one's own, that those who played along with Calr prospered, that those who didn't were crushed.

Within a year Calr could command resources of five billion credits. Then came the final step of the first stage. When the news of the strained relations between the Alliance and Rigel V was made public, the group around Calr had already sold short. Then they bought, to the limit of their resources. The news of the signing of new treaties found them in subtle control of one-third of the planet.

It has been said that a well-organized minority can control any election. The corollary to that maxim is that a powerful, well-organized economic minority can control a nation, a planet, or a planetary system.

Calr's minority controlled transportation, heavy industry, and, most

important, communications. A sly campaign of re-education was begun in the newspapers and televiewers. A softer attitude toward the Alliance, a longer view of the future of the Galaxy, admiration for the manufactures, scientific advances, art of the Alliance planets.

Gradually public opinion swayed, bent, broke. A few legislators, true to the principles of their election, listened to the voices of their constituents and urged consideration of the Alliance proposals. Many more were bought and paid for out of slush funds. The second half of the program was approaching fruition.

Behind everything was Bill Stewart. His code word was the signal for a specific plan of action to be initiated; he planned the coups, the market raids, the propaganda campaigns, the legislative programs to be pushed.

Within three years of his landing on Rigel V he could see success within his grasp, his job almost accomplished. The control of the planet's economic life was his. And through that control he held public opinion and a near majority of legislative power. Only a small core of die-hard isolationists remained.

They could never be expected to change. They were hard, ruthless, power hungry—and the paths of their ambition lay in the blocking of the Alliance. They would be by-passed, cast aside, forgotten.

The moment was almost at hand. The Alliance would not die.

Then— *The knocking began at exactly 17:53 Earth time, 27:36 Rigel V—*

"One last chance, Mr. Stewart," the fat Rigelian said. "Confess everything or be prepared for the consequences."

One last chance, Stewart thought. Only there was no chance. To be so close to victory and have everything collapse like a house of cards!

The fat one's eyes bored deep into Stewart's half-closed lids. Stewart became conscious of the lump in his throat. He had been prepared for the consequences for a long time. Not that his death would solve anything, but it might hold up the exposure of the organization for a few hours or days. In itself it would be a final admission of guilt.

"Bring in the serum!" the fat inquisitor roared suddenly.

The door opened, and the harried, nervous inquisitor of an hour ago scurried in with a hypodermic held gingerly in his fingers.

It was late then, Stewart thought. A few moments left, and he would say the word that would shatter the lump in his throat and release the virulent poison. A few breaths left to draw, a few heartbeats, a few frantic thoughts. And then nothing.

Oh, for a messenger from the king! Let the frantic courier ride his foam-flecked steed through the open door and thrust forward the message that said: Release this man—he has the king's pardon!

"We are sorry to do this, Mr. Stewart," the fat one said, but his

eyes glittered as he poised the hypodermic above Stewart's arm. His voice came hollowly, booming as if from far away.

Stewart closed his eyes and waited for the first pin prick that would tell him there was no more hope. He waited, but there was nothing. He opened his eyes.

The messenger was there in the doorway. The fat Rigelian was staring at him, his neck twisted around, the hypodermic dangling forgotten in his fingers. The messenger was ordinary—a mere official, calm, bored.

"Let him go," he said.

The fat one protested. The words buzzed around Stewart's head, senseless bee-sounds. He could make nothing of them. They led him to the door, finally, apologizing, handing him his passport. He was out on the street, dazed, uncomprehending.

After a while his head cleared. He had been walking, aimlessly, through the streets of Prayl. Then he stopped, stood completely still, trying to figure it out. Only one thing came clearly to his mind—the one word which could solve the mystery: Calr.

For an hour he doubled back and forth, until he was cetrain he had shaken off any possible shadows. When he got to the rendezvous Calr was already waiting.

He was sitting at the rickety table in the small, bare, dark room. He looked up, and his eyes were blank and unrevealing.

"How did you do it?" Stewart. said steadily.

Calr's voice was calm, emotionless.

"Plan H-30. Remember?"

"Then—?" Stewart's voice faltered.

"The treaty has been signed. Rigel V is a member of the Alliance. After that, your release was a matter of only a few moments."

Stewart sank down in the other chair, suddenly, unutterably weary. Calr's voice continued.

"Your business is broken and has been bought up at a fraction of its value through a forced sale. You have no resources and by the laws of Rigel V cannot stay on this planet. The Earth consul will advance you passage money home."

Slowly Stewart got up. Home again. Earth. His job was done. Suddenly the thought struck him: what of Calr? He stared down at the Rigelian as if trying to pierce the veil of flesh that concealed the mystery.

"Why did you—?" he began hoarsely.

Calr smiled. At least it was a good imitation of a smile.

"Tell the engineers at the Electronic Institute, Stewart, that Model Rz 17-3 was a success."

It was a long time before Stewart could tear his eyes away.

THE END

SKIN DEEP

BY FORD McCORMACK

Their captive was a very important individual on the planet. But not for political position, intellectual achievement, or any reason they might have guessed with their quick-skimming logic!

Illustrated by Cartier

"I didn't have time for more than a casual inspection, of course," said Aspic, "but the planet is reminiscent of Earth as it was two of your centuries ago. There are a number of major political divisions, a great deal of armament, but no large-scale hostilities just now."

I glanced at the screen, which was centered on the planet's twilight zone. At our distance of a thousand miles, few topographical details were visible, but on the night side, there were faint patches of light indicating sizable cities.

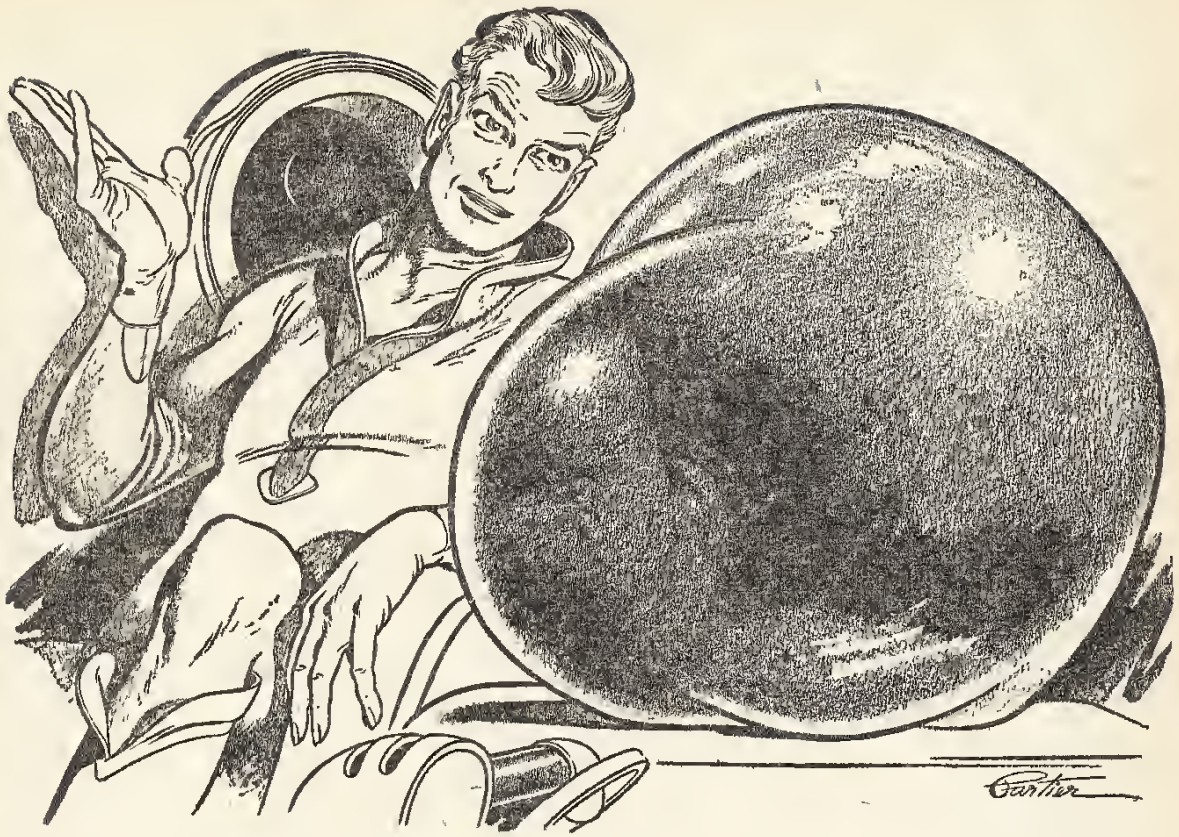
"What do the natives look like?" I asked.

Instead of attempting a verbal description, Aspic resorted to his convenient device of activating the video to reproduce an image from memory.

Its screen showed a bulbous, grayish tripedal creature, with half a dozen hairy tentacles of different lengths, protruding from what looked like holes in its skin, which elsewhere appeared to be peeling badly. Two tentacles were wrapped around a bundle of sticks which did not seem to be part of its anatomy. The torso, if it could be called that, was surmounted by a mottled, glistening lump which could have been a cranium. The lump had three pendulous, purplish sacs that could have been eyes.

I winced. "And they told me exploring would be fun! Meet lots of fascinating creatures! Most of those we've seen are fascinating in the same way as a two-headed calf! I think I prefer them without any definite shape at all—like you, for instance."

It was true. Aspic was an Ulvakian, and appeared only as a pinkly gelatinous blob partially obscuring the linguostat. The machine was an advanced type, capable of producing



most of the sounds possible for the human voice, and Aspic had acquired considerable virtuosity in operating it during these few months in space, despite the fact that verbalizing was an alien process. Ulvakians communicate with each other by a means akin to telepathy.

They likewise have no use for personal names. "Aspic" was a monicker attached for convenience by a crew member to our amorphous guest, who did not seem to mind.

"Your race is comparatively new to space," said Aspic, "and your viewpoint is residually provincial. Physiological structure is, of course, important only in relation to environment. My own, for example, had the proper degree of survival value on the aqueous planet of my origin. Yours had a desirable ambivalence in a world extensively arboreal. These creatures are undoubtedly as well adapted in their way. In fact, certain general conclusions can be made regarding them on the basis of what we already know.

"The surface of their planet is cold, because of the distance from its sun, and the atmosphere is very thin. The smoothness of the topography, and the small inclination to the ecliptic make for little variation in the weather. The amount of heat received during their rather short day is only sufficient to melt the surface of the ice with which the planet is incrusted. As a result, the planet's albedo is very high and its radiation low. Therefore it has retained much of its internal heat, as

indicated by considerable low-order volcanic disturbance and almost continual local tremors—"

"Like a skating rink with the hiccups," I put in. "It's easy to see how three splay feet would have come in handy."

"Handy? Oh, yes—another of your idioms. Their feet also have quite a number of extremely hard spicules on the under side, for traction."

"You found out quite a bit for a casual inspection," I remarked. "Did you leave your ship, then?"

"Yes, on the night side, in one of their cities. I found I could blend very well with the icy surfaces which occur everywhere. And their air has so little oxygen that I found it considerably less caustic than yours. However, I maintained my usual protective film because of the congealing effect of the cold on my surface tissue.

"The air is so thin that sound conduction is poor, and it may well be that these beings have no sense of hearing at all. The compensating advantage of three-hundred-and-sixty degree vision is obvious. Yet there is some evidence that they are color blind—which is no handicap at all in their drab environment. Their visual acuity, however, must be very high, since even direct intercommunication seems to be based on it.

"And so it goes. From the functional point of view, ugliness is only an indication of emotional ignorance on the part of the observer."

"I'll concede the argument," I said, "which, however, doesn't seem to have dented my emotional ignorance. They still look ugly. Where is the functional utility, for instance, in having a scmidetached skin? Or is it the molting season?"

The linguostat emitted a gobbling sound, indicating a surprise reaction which had caused Aspic to jangle the controls. There was a pause, then:

"Anthropocentricity!" said the colloid, to show its mastery of the instrument. "Those happened to be clothes!"

I blinked. "No!" In my mind's eye, I recalled how the creature had looked, and promptly saw that Aspic was right. Suddenly, the whole thing seemed so ludicrous that I chuckled.

"Are there no limits to your conceit?" Aspic managed to impart an exasperated inflection to the machine. "Now you are amused at the idea of clothes simply because the anatomical parts emerging from them are nonhuman! This race has about as much need for covering as yours, even though their skin is considerably thicker. And they have undoubtedly developed the highly artificial *mores* characteristic of clothes-wearing races everywhere—including Earth. The individual whose image I transmitted was, in fact, more simply dressed than most, being younger and of lower social status. Some of them dress quite elaborately, though, of course, with no regard for color."

I subsided. "What was the bundle of sticks for?"

"They were composed of silicates, I believe—organic material is scarce—and inscribed with innumerable fine lines which you could not even see without magnification and whose length and spacing seem to be their equivalent of a printed language. I believe they can produce similar patterns of lines, somewhat larger, in the delicately muscled skin of the head, for direct communication. A rare, if not unique, system. The sticks, I think, bore accounts of current happenings, which the individual was offering in exchange for a small unit of the credit medium—"

"Don't tell me!" I chuckled again, in spite of myself. "A newsboy! I suppose you would find nothing humorous in the mere parallelism, but the type fairly symbolized a considerable period of our recent history."

"At least," said Aspic, after a pause, "your unfounded revulsion for this type should make it easier for you to take the sensible course, when we have finished our business here."

"You mean silently steal away? I'm ready to do that right now. The thought of taking one of those monstrosities aboard for examination is less than appealing to me."

"Nevertheless, it must be done, to complete your report." The linguostat seemed to convey a genuine tone of reproof. "Although I know your basic judgment to be fairly objective, I continue to wonder that your government saw fit to place such an emotional personality in charge of this important expedition."

"They had to," I said. "Everybody else had so much pull, a compromise was necessary. I was the dark horse."

"For the peace of the galaxy," Aspic returned, "I trust that is an exaggeration. But I'm glad I came along, otherwise I'm not at all sure that you wouldn't still be on that planet with the humanoid matriarchy, teaching them the secrets of space travel. In that case, as an example of your restricted orientation, it was the *lack* of clothing that seemed remarkable to you—despite the uniform, tropical climate."

I closed my eyes dreamily. "Now, there was a race that would have had a stimulating effect anywhere—at least on other humanoids. A little warlike, perhaps, but a gorgeous bunch of hussies! Of course, that wouldn't mean anything to a jelly . . . to a collaid like yourself. But seriously, it does seem a shame that a civilization almost within reach of the stars can't be helped along a little. And there seem to be so many of them at that particular stage."

"Including," said Aspic, somewhat dryly, I fancied, "this one."

I frowned in spite of myself. "Yes, for that matter, including this one! Millions of little excrescences still unborn, who will be chained to a planet from which we could so easily free them." I shuddered.

"Or, perhaps, loose them," said the Ulvakian. "You know the reason there are so many civilizations

'almost' within reach of the stars. It is because, technologically, the means of escaping from a planet are invariably concomitant with the means of virtual self-extermination. These are the crossroads at which most civilizations eventually arrive —and an alarming percentage of them make the fatal choice, or rather become the victims of one or more of their own minorities.

"A thousand years ago our civilization adopted the strict policy of noninterference, and it has been a wise one. A people which has to be helped into space has to be policed to insure its good behavior—which inevitably deteriorates under policing. No, we are content merely to observe such internal struggles, and to keep ourselves well-posted regarding our own vicinity.

"We were pleased when your representatives came to us and signified the same kind of interest in your neighboring systems. We cheerfully supplied you with complete information about that part of your proposed zone which overlaps ours, and I was sent to lend our experience in the task of exploring the rest of it. We were glad to assist in such a farsighted enterprise. But do you think it would have been wise of us, two centuries ago, to have given our knowledge to your socially unstable, short-lived forebears?"

I considered. "That would have been about the middle of the twentieth century. I believe the average life span then was less than a hundred years. Of course, we're still not up to you by a long way."

"No, but you have made great strides—enough to dull the edge of a sort of envy that can be very dangerous. Geneclectic science, now well-known to your race, was of no benefit to its discoverers, for example, nor to anyone then living. It can only be applied preconceptively. The psychosomatic factor of longevity, which is next in importance, cannot be taught an adult without great difficulty, and cannot help him much in any case. The result of introducing such principles suddenly is likely to be an unmanageable mass of frustrated individuals who cannot be taught anything except hate.

"In general, any great advance must come from within the race as a normal development in order to become a stable attribute, and we were very glad that yours achieved substantial longevity before it was able to leave your own system. But you know all that. I merely repeat it to emphasize that on the galactic scale altruism is usually thankless and can be downright disastrous. In your position, you must fully understand that."

"Look," I said, "you were able to convince me that we should fade away, dissolve, but not quite forget those comely females, so why would you expect me to give you an argument here? I bow to your superior sociology. We will not fraternize with these quaint folk longer than necessary, much as I'd love to! In the meantime, are you coming with

us for the snatch?"

"No," said Aspic, "I'm sure you will handle it quite adequately. But I am going to the planet by myself to investigate the matter of their peculiar language, which interests me greatly."

"If you get over on the day side, be careful," I said. "Somebody might see you."

"As long as one avoids centers of population, it's nothing to worry about," said Aspic. "Who on Earth would believe it, two centuries ago?"

A few minutes later, the screen showed his odd personal craft, a silvery, disk-shaped affair, wheeling off into the distance on its faint jets, like a ghostly pinwheel. Its basic principle, while ingenious, is not efficient for human transport, because of the inflexibility of the proportions involved. The size of the central passenger compartment, which must be spherical for stability, determines the diameter of the craft. A fifty-foot disk would be required to carry one of us in reasonable comfort; Aspic's was less than a third of that.

The Ulvakian, although of about the same volume and weight as a human being, was quite at ease in his sixteen-inch capsule.

The business of kidnaping had become fairly routine by this time. As nominal director of the expedition, I was not, strictly speaking, supposed to go along. But as the only nonspecialist aboard a ship complete with its own crew and a competent captain, I nurtured no illusions regarding my own expendability. And the long confinement was tedious.

There were eight of us, mostly crew men, in the ship's dinghy. We dropped down on the night side, toward one of the cities to be sure of encountering some residents, but avoided its center of population. A great outdoor amphitheater on the outskirts, well filled with unhumanity, seemed a likely spot. We came in low, cut the jets to a whisper, and landed largely with the antigrav in the concealment of some scrub trees about a hundred yards from the big bowl. Nothing stirred within our range of vision—we were on the side away from the several-acre parking lot, containing hundreds of vehicles which from the air had appeared to be motor sleds. We had seen no roads at all; on this nearly featureless countryside, they were probably needless.

A party of four, including myself, left the dinghy, having already donned spacesuits. As the man before me stepped to the ground, his feet shot out from under him and he fell heavily. His curses reverberated in my head globe, via radio, as he slowly picked himself up. Thereafter, we proceeded with gingerly tread over the ice-incrusted ground.

A row of small buildings, some with lights showing, became dimly visible, shadowed from the sickly glow of a pint-sized moon by the jutting superstructure of the arena. As we entered the shadow, a door opened in one of the buildings not fifty feet from us, and a grotesque

figure was silhouetted by the light beyond. It bore an unmistakable resemblance to Aspic's video reproduction, and I was just as glad the dimness precluded a clear view.

The creature proceeded directly toward us, seeming to roll along as if on wheels. As it came closer, however, the fluttering motion of its three almost legless, ducklike feet was discernible, the two nearer ones working rapidly in opposition to the third.

We had all stood motionless since the opening of the door, yet with its acute eyesight, the being must have been very preoccupied not to have noticed us sooner.

It stopped suddenly, momentarily resembling an overgrown, petrified penguin, then began back-pedaling with every appearance of frantic haste. It did not occur to me until later that the tri-symmetrical creature had nothing to gain by turning around.

With a restraining gesture to the others, I raised my shock pistol and pulled the lever all the way back. The cone of vibration produced was guaranteed to paralyze anything in the galaxy with a central nervous system at close range, and to keep it that way for hours. Sure enough, the creature went down, looking so much like a monstrous roly-poly toy that I half-expected it to bounce back up again.

But it remained unmoving as we gathered around, though the two baleful, winkless eye-sacs that we could see were disconcerting. There was now the unpleasant chore of transporting at least two hundred pounds of slightly nauseous specimen to the dinghy. And there was no time to be lost, with so many of its own kind so close.

I resisted an impulse to suggest simply dragging it over the slick ground. Its skin seemed adequately tough for the purpose, but such a procedure would have conflicted with our strict policy of gentility. So two of us grabbed a splay foot each and the other two, including myself, reluctantly laid hold of a pair of the stouter-looking hairy tentacles. Slipping and stumbling, we lugged our burden through the wan moonlight toward the dinghy. We were halfway there, when all four of us lost our footing at the same instant. And what was worse, our efforts to avoid dropping our captive too hard caused us to sprawl all over it and each other. I managed to get myself entangled in the foul embrace of several tentacles, and for a time, the tough fabric of my spacesuit seemed pitifully thin and porous. I could feel stiff hairs and squishy anatomy right through it.

It may have been that each of us thought at least two of the others had been inexcusably clumsy; at any rate, my own grunts of dismay were interspersed with lurid mouthings from the others. I personally made three attempts to get up before I became aware that the ground itself was shaking.

Into my mind flashed the phrase

Aspic had used a few hours before: "almost continual local tremors." We had been betrayed by a moderately stiff earthquake.

Having made the discovery, I contrived simply to roll myself clear of the monster, and wait for the terrain and my queasy stomach to subside, which they presently did. A look about showed no hysterical mob squeezing itself from the gates of the arena, as would surely have been the case on Earth. I wondered if the quake had even interrupted the show.

Our glum and battered group completed the portage to the dinghy without further mishap. Those aboard emerged from the lock with the "cage" as we approached.

The "cage" had been developed and constructed since leaving Earth for the general purpose we were engaged in at the moment—kidnaping. It was a three by four by six, partly transparent tank, capable of maintaining a considerable range of pressures and temperatures, and a variety of gaseous mixtures. Its gauges had already been set to duplicate this planet's surface conditions. We popped our captive into it like an octopus into an aquarium, closed the hatch and sealed it. All eight of us were wrestling it into the air lock, when one of the men spoke sharply:

"Look out!"

I whirled, as did the others. Twenty feet away stood two of the local denizens. Though it was impossible to tell which way they had been going, they had apparently emerged from behind a nearby hillock only a moment before, and so had just spotted us.

They suddenly came to life and began scuttling away, with surprising speed. We had no choice as to our course of action. Four shock pistols were activated at almost the same instant, bowling them over like tenpins. And, like tenpins, they rolled a bit before their rotund carcasses came to rest.

"Let's get out of here!" I said. The cage was inside the air lock in half a minute, but after closing the outer hatch, we took another full minute to irradiate the lock and everything in it before opening the inner one. Thousands of alien beings, generally speaking, were less dangeorus than millions of alien germs.

Back aboard the main ship, we transferred our dubious prize from the portable chamber to a roomier one in the laboratories, irradiated ourselves once more, shucked our spacesuits and turned in for a needed rest.

On awaking, some eight hours later, I found a message from Aspic, dated within the last hour.

It seems that I was optimistic in believing, on the basis of my first inspection, that international friction is at a minimum on this world. War sentiment would appear to be running high in at least one of the more powerful countries, although, of course, the language handicap imposes limits on such inferences.

It may well be that we have chanced upon a major crisis of this civilization, and

Mr. Lambert agrees, as I am sure you will, that no time should be lost in acquiring the means of understanding it more clearly. To this end, he will accompany me —in a life shell—to the planet where we can combine our analysis with discreet observation. We shall, of course, report as soon as we learn anything of interest.

I frowned. Lambert was our linguistics expert, and although he could probably add little to Aspic's ponderous knowledge of the subject, I did not doubt he would be an asset. But for the two of them to expose themselves jointly to the risks of a strange planet was unsound policy.

Discipline was scarcely more than an abstraction aboard this ship. The scientists and technicians quite generally knew so much more about what should be done than I did, that I had preserved a modicum of good will by limiting interference to cases where scientific zeal tended to scoff at safety regulations. And here, it struck me, was a borderline case.

Well, it was too late to do anything about it now. At least, they had not taken the dinghy, the loss of which would inconvenience everybody.

As to the impending strife, and whatever ultimatum or incident might have provoked the crisis, I could not muster any real interest. The fault was undoubtedly mine. I both admired and lacked the scientific imagination which enabled Aspic to associate these alien creatures with intelligent beings elsewhere, and to regard their problems as relatively important.

When I returned to the labs, with my stomach securely anchored by a hearty breakfast, I was able to view our captive with greater equanimity. It had regained consciousness a few hours previously, and had already been put through most of the preliminary routine by our efficient team of specialists.

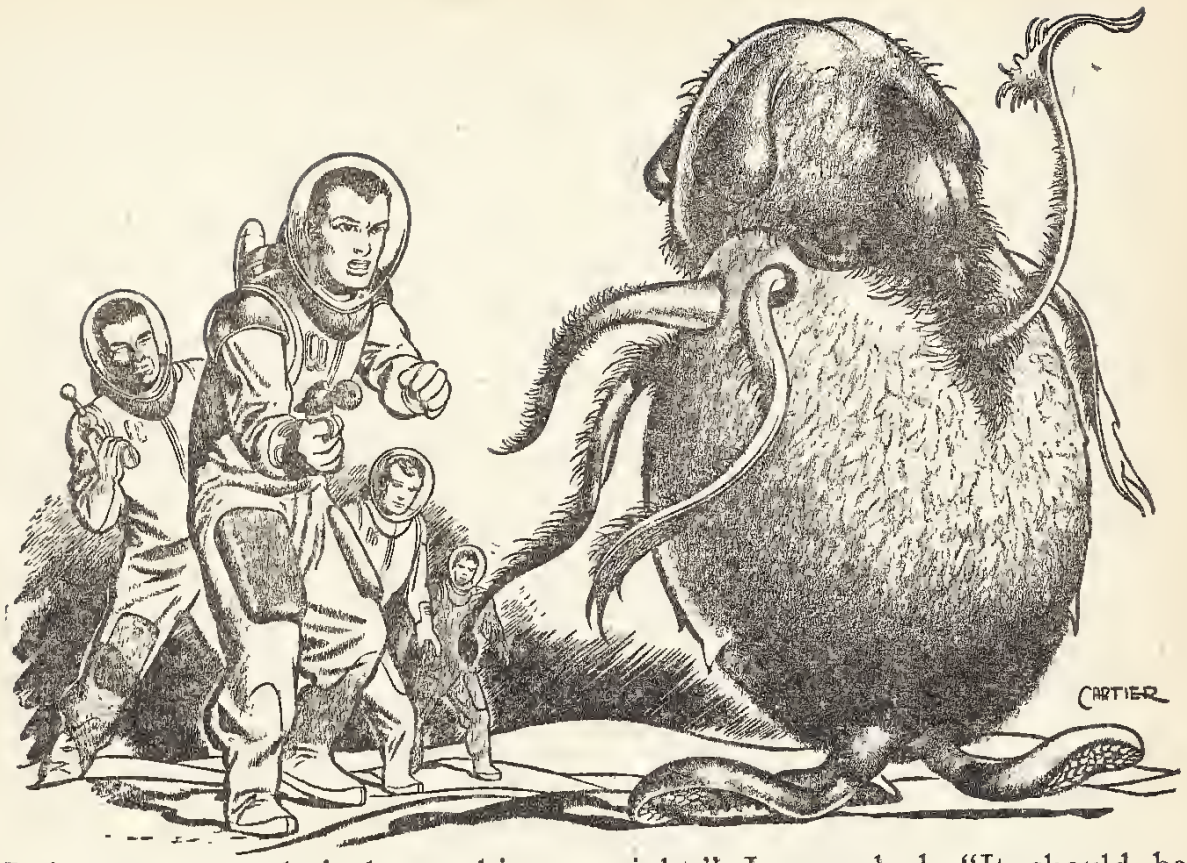
Later, the creature would be anaesthetized and exposed to as thoroughgoing a physiological and biochemical analysis as could be conducted without harming the subject. A major purpose of our interstellar tour, in addition to gaining strategic knowledge of our zone, was to compile a master biological category of living races within it.

The present part of the examination was conducted solely by means of instruments operated outside the observation chamber.

"How are things going?" I asked Berne, the psychologist.

His paraphernalia included a projector for presenting various images to the subject and an array of ultrasensitive recorders for registering the reactions. The technique had been evolved to determine many factors of basic psychology, intelligence and so forth, without the need for linguistic communication.

"Passably well," said Berne, with a dubious expression on his saturnine face. "The subject has done nothing to interfere with the tests. On the other hand, there is a persistent fear-reaction which is not contributing to the accuracy of mine.



It is not even—relatively speaking—normal."

"What do you mean by that?"

"Well—for example, the simple idea that we are visitors from another planet. As you know, we have a presentation technique guaranteed to transmit this idea to any individual, even unconsciously aware of the most rudimentary facts of astronomy. But it has failed in this case, even with several repetitions. There are other indications that the subject, while no genius, has a basic intelligence equal to the task. But somehow it just doesn't register. You understand, this is not a case of the mere rejection of the notion as a hoax—a not uncommon reaction. It is simply a complete failure to grasp the idea itself."

"Aspic says they have terrific eyesight," I remarked. "It should be able to see us better than we can see it, and can surely tell that we are neither puppets nor robots. I wonder what it thinks we are?"

"That's just the point," said Berne. "It probably doesn't think about that at all. Fear seems to have blocked all thought-processes other than those concerned with immediate causation. In other words, it feels no obligation whatever to speculate regarding our nature, as would a normally curious individual.

"But it is true that its eyesight is remarkable. Apparently, the visual center of the brain receives a large number of varying image-patterns from the multifaceted eyes, and tests show that it does a marvelous job of selection and interpretation. The result seems to be a composite pano-

ramic field of a clarity which would probably make the terrestrial eagle appear myopic.

"Here is one instance where advancing civilization, because of a peculiar demand for nonauditory intercommunication, has sharpened the visual faculty to its limit, instead of dulling it. However, there is some evidence to indicate that eyesight which functions in this manner might be more confused by completely unfamiliar objects than ours. This may account in part for our subject's unreasoning terror."

I studied the creature through the glass, not without a slight revulsion at recalling our inadvertent intimacies of the night before.

It stood in the exact center of the chamber, swaying slightly on its three broad feet, which suggested small doormats woven of coarse rope. Its general structure had an oddly synthetic appearance, as if Miss Muffet's spider, grown huge, had been grafted on to Humpty Dumpty.

Its clothing was distinguishable as many yards of drab, badly frayed cloth running in ragged folds every which-way among the tentacles and about the globular torso. Here and there, a loose end drooped in an unscheduled manner which I could not recall noticing the last time I had seen the creature erect, before the earthquake and the ensuing tussle.

And then, as I looked, my stomach once more shifted its moorings slightly. For the creature had lifted a flap of gray flesh around the base of its cranial bump, exposing a bilious, brownish-green layer of pulpy tissue underneath, and was causing it to writhe in a positively gruesome manner.

"Why is it doing that?" I asked Berne. "It looks like it might be trying to yodel."

"No chance of that," said Berne, "having no vocal chords. As a matter of fact, we've all wondered about that odious little trick. It seems to occur whenever one looks at the creature steadily for a few moments. Probably only a nervous habit, like biting fingernails."

"Wonder what its function is in its own society?" I mused. "In its present state of agitation, I suppose that would be hard to determine. It's at least as ragged in appearance as a newsboy that Aspic portrayed for me, and is very likely of about the same social status. Judging by the circumstances in which we encountered it, I've been thinking it might be a janitor or the like."

"Its general intelligence, so far as I can tell, is commensurate," said Berne. "Though there seems to be traces of a certain egotism ill-befitting such an occupation. However, maladjustment is apparently widespread in races at this stage of social development. Incidentally, the term would be 'janitress'—this subject is a female."

For some illogical reason, I found the pronouncement difficult to believe, and for no better reason, the creature looked about fifty percent

uglier, if possible, when I glanced at it again. My attitude at the moment would have elicited a pungent scolding from Aspic, I could well imagine.

"How can you tell?" I asked curiously.

"Well—actually there is far less external distinction than between human sexes, although these beings' super-eyesight seems to restore the equivalence fully. Aspic left us a variety of images of both sexes, which we have shown to the subject. As revealed by different patterns of reaction, sex-identification is definite and immediate.

"Generally speaking, of course, one can be misled by the terms 'male' and 'female' themselves. The lists of factors which constitute their terrestrial denotations often become so interchanged when applied to otherworld species as to lose all meaning. On this very trip, you will recall, we encountered one race of clearly marked bisexuality—yet each sex gestated its own. But here, the parallelism is sufficiently close to justify the human designation. It is even closer than in the case of Aspic, whom we regard as a male."

I shook my head slowly. "I still can't think of 'it' as a 'her'. Perhaps a name would help, since the creature lacks a verbal one. 'Ermintrude' is the most uneuphonious feminine name that comes to mind. How does it strike you?"

Berne grinned. "'Ermintrude' it shall be. Do you want it inscribed in our records?"

"Well, no," I said. "I'm afraid our sponsors have no official sense of humor. To them, in fact, Aspic is still Ulvakian 2837."

"Speaking of whom," said Berne, "I suppose he told you about the rumblings of war?"

"He left a note. He and Lambert went off to the planet, apparently burning with curiosity as to what brought on the situation."

Berne shrugged. "I can't see that it matters much. Earth history shows that when nations are so disposed, they are about as likely to go to war for a bad reason as a good one."

Berne's final remark came sharply to mind, some three hours later, as I stared in disbelief at a message handed me by the communications operator. It, too, was from Aspic:

> It is imperative that you release the captive at once. The explanation is too involved to present here, but there is a definite connection with the critical state of affairs on this planet. I must ask you to accept my considered opinion that the matter is urgent, and to return the captive forthwith to the original locality, which is now entering the twilight zone. Mr. Lambert and I will remain here to observe the result and will thereafter report to you in full.

A little dazedly, I started toward the labs, message in hand. All I could think of at the moment was how supremely silly it would be for a world to take up arms over the kidnaping of a janitress. Then a more rational notion occurred. Perhaps Ermintrude had just committed some crime—had even murdered

someone of importance—before the capture. It was plausible enough that we could have been mistaken for agents of another government, in our alien craft, particularly after the testimony of the two bystanders had been bandied around a bit. The other government might thus be blamed for Ermintrude's crime.

As it turned out eventually, some parts of that hasty theory were close to the truth. And in a way, the truth made far less sense.

Three of the scientists, wearing special, light-weight pressure suits, were working directly on Ermintrude, who was stretched out unconscious on a table in the observation chamber. I spoke to them through the intercom:

"Well, gentlemen, it looks like you'll have to pump the blood back into the subject. Aspic says we must send her back pronto. Take a look at this." I held the message up to the glass.

Nobody seemed amused at my flippancy. Two of them stepped over immediately, read the message and frowned in puzzlement. After completing some manipulation or other, the third, our neurologist, did likewise and looked downright annoyed.

"I would very much like to—" He broke off with a shrug. "But go ahead. We have enough for the report."

Fortunately, Ermintrude had proved susceptible to narco-hypnosis, and was under it at the moment. I called in Berne, who took care of the final conditioning. This included full amnesia regarding the entire experience, so that Ermintrude's friends—and possibly Ermintrude herself—wouldn't think she was nuts.

Inducing it was a relatively difficult procedure, being nonverbal, but Berne accomplished it in short order. Within two hours of receiving Aspic's message, we had deposited Ermintrude, safe, sound and semiconscious, within half a mile of the spot where we had found her, which was as close as we thought prudent. Before taking off, we gave the creature an injection which would revive her in a few minutes, so that she would not catch her death of whatever virus preyed on overexposure in that world.

We saw nothing of Aspic and Lambert in the vicinity, yet we had scarcely returned to the ship when they sent word that Ermintrude had been found. I wondered what vantage-point had enabled them to learn of the event so quickly. Later, I discovered they had boldly encamped, after dark, on the rooftop of the building which housed the largest newspaper—or perhaps the term would be "news stick"—in the region. From there, it was a comparatively simple matter to pilfer a copy of each edition hot off the presses.

But I didn't find that out until many hours later, and in the meantime, all our communications operator could extract from the errant linguists was an occasional, annoyingly unspecific report. After one which said merely: "Situation still

unsettled," I gave up in disgust and went to bed.

The next "morning" I found Aspic dolloped on the linguostat in my office, awaiting me. They had come back only a short while before, and I surmised that Lambert was catching up on his sleep. Aspic, whose nodular nervous system enabled him to restore his tissues in a piecemeal fashion, had no need of such a time-consuming practice.

I swallowed a caustic comment that occurred to me, along with a caffeine tablet from my desk. I was too curious to engage in recrimination, and for the same reason I had not taken time for my usual coffee, without which I felt a little dull.

"Well, I'm fortified," I said. "Now for that involved explanation. But not too fast, please."

"The explanation is not involved at all," said Aspic bluntly. "It is, in fact, quite simple. I must apologize for having misled you, but I considered it necessary."

I blinked. "What do you mean?"

"I mean there was good evidence for believing that you might have found the explanation so incredible as to be rendered indecisive by it. And it was important that the captive be released promptly. Since then, we have obtained substantial documentation, in the form of translated news accounts, which ought to convince you. Perhaps if I were to quote one or two excerpts—"

"Wait a minute," I said. "How about giving me your own explanation first? Could you possibly state it in one sentence?" I popped another caffeine tablet into my mouth. The first one hadn't helped, as yet.

"I think so," said Aspic, "at least by implication. In terrestrial idiom, it is simply this: The specimen you chose is regarded by her own race as a queen of beauty."

I promptly discovered that the maximum stimulation obtainable from a caffeine tablet is at the entrance to the windpipe. When I recovered somewhat from my paroxysm, Aspic continued academically:

"The throng at the outdoor theater had come primarily to see her. I believe she was going to dance, as the climax of the performance, but that point was never made clear. Apparently, her enormous popularity is not based on any particular talent, but merely on a high degree of conformance with current standards of anatomical perfection. I think you will concede that your own history contains many parallels.

"You kidnaped this individual shortly before she was scheduled to appear. This was not so much of a coincidence as it might seem at a glance, if you stop to consider that of all the thousands present at such gatherings, the only ones who are really free to wander about until called for are the principal participants.

"Because of these circumstances, at any rate, the affair created a sensation overnight—and it was impossible to suppress the eyewitness accounts which naturally suggested the complicity of foreign agents.

"Among an emotional people with an irrational ideology of sex, the significance of the incident could hardly be overestimated. You had figuratively invaded the libidinous seraglios of several million males and carried off the favorite concubine from each."

I recall having the whimsical notion that Aspic was really an ectoplasmic manifestation of Baron Munchausen and would presently tell me how he won the war single-handed.

"What finally happened?" I asked weakly.

"I think a quotation from the last news account we saw will answer that question," said Aspic. "But remember, it is what you might call a highly poetic, or subjective, language, and no meaningful translation is possible for many terms. The gist of the account in your tongue, with the substitution of numerous rough equivalents, is as follows:

" 'This galvanic female, who by the tantalizing twitch of a single tentacular bristle, or by the demure and appealing undulation of her masticatory fringe, can make a thousand proud males yearn to throw themselves at her delicately gnarled feet—' "

"Undulation?" I exclaimed. "That sounds like a passable description of a peculiarly revolting habit the creature had. We put it down to mere hysteria. Do you mean to say—"

"Self-preservation," said Aspic, "combined with ignorance of your intentions, must have called forth the one resource which had never failed her previously. In short, she was exercising her personal charm, in the instinctive hope that you would find her too lovely to kill."

"Charm . . . too lovely—" My voice dissolved into something resembling a gargle.

"I hope," Aspic commented, "this development will have a wholesomely disturbing effect on your provincial attitude, so that the next time—"

"All right, all right!" I returned. "You might even say the princess was carried off by the goblins—it's all a matter of viewpoint. But at the moment, you could knock me over with a tentacular bristle."

Aspic continued with the translation:

" '. . . had fully recovered from her terrifying ordeal and was her gracious, gibbously beautiful self again. Yet when she was questioned regarding the heinous kidnaping, whose perpetrators are known to the police and will surely be arrested within twelve—there follows the untranslatable designation for twelfth-parts of a day—this scribe beheld those celestial eye-sacs droop about a millimeter in frightened recollection. There was a definite agitated curvature in her cultured pate-lines as she told of her harsh treatment at the hands of the brutally efficient thugs who spirited her away two nights ago, and who released her early this morning, after their de-

mand for a fabulous ransom was met by a wealthy sponsor whose name is withheld. She expressed typically feminine concern over the ruination of the intricately gorgeous costume she was wearing, the creation of perhaps the greatest weaver of our—' "

"What a shame!" I broke in. "And to our unrefined eyesight it just looked tattered! But what's all this talk of a ransom? As you know, that galvanic female was given the full amnesic conditioning before we released her. Why would she dream up some wild yarn about criminals of her own race making off with her?"

"I doubt if the story is her own invention," said Aspic. "It seems evident that some representative of her own country's diplomatic service reached her in time to guide her public utterance. And you will notice that even in this somewhat extravagant account there is no mention of international complications."

"But why? From the evidence of the two creatures who saw us, and discounting the part of their story which would have been unbelievable, the culpability of some unfriendly nation would seem to be an easy theory to arrive at, even for the government authorities."

"Very easy," Aspic agreed. "And they probably did. But this particular nation happened to be one which was neither anxious nor ready to go to war. The suspected government, on the other hand, is attempting to bolster its shaky tyranny by fomenting hatred toward others. It would willingly go to war—providing the blame could be placed elsewhere. In this case, they were forced to deny the accusations, which they did as insultingly as possible.

"If matters had worked out the other way around, which they just as easily could have, that nation would have made the most of it. We might have plunged this civilization into the worst—and perhaps the last—war of its history."

"Henceforth," I declared, "we'll recruit our examinees from the slums. But I'm afraid I interrupted your recitation—although I have a strong feeling I've heard everything!"

"The rest of the account is uninformative," said Aspic, "except to show that in spite of hyperacute vision, these people, like emotional races everywhere, see very much what they want to see. It is even likely that their superior faculty is a grave sociological disadvantage. Think how much more opportunity there is for the establishment of minority and pseudo-racial prejudices, when the slightest variation of structure or contour is apparent to everyone. In fact, on the basis of what I have seen here and of five hundred years' previous experience, my prognosis for this civilization inclines toward the negative."

For me, the last traces of ludicrous humor faded from the situation. I suddenly felt very sorry for Ermintrude and her ill-fated kind.

THE END

THIS IS HOT!

BY ARTHUR C. PARLETT, JR.

The problem of old razor blades is familiar—but the problem of old radioactive isotopes is really a dilly. Where do you throw old isotopes that stay deadly for the next few thousand years? It's a real problem today!

This concerns you.

Atomic power plants are not yet here but they will be soon. The number of nuclear reactors is growing. Because this is so, radiation takes on major importance in your physical environment.

So far the methods developed to keep radiation under control have proven effective; not perfect, they are adequate.

It's a sobering thought to realize that as recently as the middle twenties people deliberately introduced small quantities of radium into their bodies because they wished to enjoy "radiant" health. Many died, horribly, and paid large sums of money for the privilege. In the ignorance of those days—only a little more than twenty years ago—workers in a clock factory employed in painting luminous figures on the dials pointed their brushes by touching them to the lips thereby absorbing infinitesimal amounts of radium. Some died. And some still live, the radium concentrated in their skeletons still active and inducing sickness, degenerative changes in bones, tumors and cancer. This occurred in the dark ages of our understanding of radiation. Naturally, nothing like that could happen today. Yet—

In 1948, four specially trained scientists, assisting in the Eniwetok peace demonstration, underestimated the danger and exposed their hands to beta radiation. Proper safeguards were provided but these men were in haste.

One recovered completely in fifty days.

Seven months after exposure it was necessary to employ plastic surgery on the hands of the others because unaided nature could not provide a tough enough skin to cover the wounds.

Let there be no mistake: Fa-

miliarity with radiation breeds—respect!

This article has a four-fold purpose:

(1) To describe how radioactive waste products arise.

(2) To discuss the nature of radiation and its implications to you.

(3) To outline the steps now taken to control radiation due to waste products.

(4) To stimulate thought on better methods of disposal of radioactive waste.

Older readers of Astounding SCIENCE FICTION are urged to refer to the article "Atomic Power Plant" in the February, 1947 issue for an excellent discussion of the basic principles of nuclear reactors, and one possible design of an atomic pile suitable for power generation. For those not already familiar with the operation of a reactor, the following brief outline may be of value.

When an atom fissions, its nucleus splits into two parts. Each part then becomes the nucleus of an atom of another element. The sum of the atomic weights of the generated atoms equals — approximately — the atomic weight of the mother atoms, the difference appearing as energy. Fission is triggered by a neutron entering the nucleus of an uranium atom. Rapidly the uranium atom splits apart and spits out anywhere from one to three neutrons. This is the basis for the chain reaction.

Given proper conditions, these neutrons will enter other uranium atoms and the process will be repeated. Uncontrolled, we have an atomic bomb wherein the energy release is so fast that temperatures of millions of degrees are reached in millionths of a second. But if the atmosphere of neutrons is controlled by the use of some neutron absorbing, nonfissionable material, the rate of burning can be controlled and atomic fire can be put to useful work —the breeding of new fissionable material, the production of radioactive isotopes for industrial, biological and medical purposes, and the generation of power in form suitable for transmission.

It is not germane to the present discussion to consider in detail the two classes of reactors that are in use at the present time, but mention of the characteristics of each is not out of place. In the homogeneous, or "water-boiler" type exemplified by the Los Alamos reactor, the fissionable material is dispersed uniformly throughout the reactor by making a solution of some soluble salt of enriched uranium. The design is comparatively simple, certainly the construction is more facile than the heterogeneous type discussed below. But as far as the author knows there has been only one such reactor made, and the reason is not hard to find. A homogeneous mixture of natural uranium and graphite, or natural uranium and ordinary water, simply cannot sustain a chain reaction capable of being harnessed. The bombs ex-

ploded over Japan and Bikini were homogeneous reactors, but they employed no moderator and the fissionable material was either U-235 or Pu-239, not natural uranium, nor was any attempt made to control the energy released. If H_2O is used as the moderator, then enriched uranium must be used as the fuel; if natural uranium is the fuel, than D_2O must be the moderator.

The other difficulty connected with the homogeneous type of reactor is the cost of recovery of the valuable products of reaction, which varies directly with the total quantity of material handled. In the homogeneous type of reactor a very large volume of slurry must be handled in order to replace a small percentage of the fuel consumed in the reaction. Furthermore, not only the active portion of the charge to the reactor must be reprocessed, but the diluent as well. Finally, the greater the volume processed the mathematically certain fact is that in absolute terms a greater amount of the sought for materials will be unrecovered, and the waste disposal problems will be that much more important.

On the other hand, the "heterogeneous" type of reactor, typified by Hanford, charges aluminum clad uranium slugs to a lattice of graphite blocks. The holes in the blocks are located on a carefully calculated center-to-center square pitch, and lined with tubes. To make the operation continuous, the slugs of uranium are slowly passed through the tubes, a spent slug being removed for reprocessing as a fresh slug is charged.

Operation of the reactor produces great quantities of heat which must be removed if the pile is not to melt into shapeless and dangerously radioactive slag. Therefore, some cooling medium is circulated through the annular space between the slugs and the tube wall. At the present time the two media used for this purpose are water and air, both in fantastic quantities, although it is not true, as some of the more naive believe, that the entire volume of the Columbia River is circulated through the Hanford pile. The cooling is done on a once-through and out basis. In the process the coolant is subjected to irradiation by neutron bombardment as it passes through the pile. Contaminated, its impurities made radioactive, can it then be made safe to discharge to the atmosphere or the streams? That is one of the disposal problems.

Here is another. Consider the spent slug being removed from the reactor. Besides uranium, it now contains plutonium, neptunium and various radioactive fission products, e.g., barium and krypton. The slug is removed from the tightly fitting aluminum jacket by chemical means, and the residue is subjected to all the long processes the quantitative analysis student knows so well; fractional precipitation, filtration, washing, reprecipitation, rewashing, et cetera ad nauseam. Once the uranium, plutonium and the fission prod-

ucts have been removed, what are we to do with the waste liquids which necessarily contain some radioactive products?

Accidents must be both guarded against and provided for; they do occur. Suppose an uranium slug should rupture and the uranium and fission products escape into the cooling water and thence into the river. What provisions can be made for such a contingency? Or the even more probable case of spills occurring in a "hot" laboratory may be considered. How is decontamination to be attempted and what shall be done with the waste?

Other than air used as a reactor coolant, which produces significant amounts of argon-41—radioactive—and moderate amounts of carbon-14, probably the most important sources of gaseous waste are chemical separations of fission products from unused uranium and plutonium, and the combustion products resulting from the incineration of radioactive wastes and by-products. It cannot be emphasized too much that radioactivity is not affected by any chemical or physical process; incineration reduces the bulk to be handled but not the radiation to be guarded against. Cases have been noted of radioactive iodine being found in vegetation many miles from the source, carried there by air currents!

At the present time the disposal of solid waste matter is just as troublesome as the other states in which the waste may be. Solid radioactive waste may be exemplified by such items as contaminated laboratory equipment, valves, motors, piping, and even clothing.

". . . The apparent advantages of the compact nuclear fuel . . . are to a considerable degree offset by the complications . . . of the disposal of radioactive wastes," says Clark Goodman,* adding in a footnote, "This serious problem has not yet received much attention."

It is possibly superfluous to emphasize the very serious nature of the problem to the readers of a magazine which long ago was printing such stories as Heinlein's unforgettable "Solution Unsatisfactory," and the grim tale of "Tomorrow's Children." Yet it might not be taken amiss if we dwell for a little on the nature of radiation.

Medical history records some nasty passages describing terrible burns and cancerous tissue resulting from the ignorance of the early days of radium and X ray, caused by radiation forces which man did not understand. We seldom hear of these things any more, but it is good to remember that they have happened and that the danger is real, if not imminent. Bear in mind that the total radium supply of the United States is only about thirty ounces, but that in each of our nuclear reactors we have the equivalent of hundreds of tons of radium. Prudence and foresight must mark our way.

*The Science and Engineering of Nuclear Power. Vol. II. Page 291. Addison-Wesley Press, Inc. 1949.

In passing, it might be noticed that one system of classifying radiation subdivides it into two classes, "soft" and "hard." "Soft" radiation is typified by heat and light waves. Some of you photographers may have taken pictures using an electric iron as your source of energy. That was "soft" radiation. It is of no interest to us in connection with this article. What we are concerned with, and what the terms shall always signify in the balance of this piece is "hard" radiation. Equivalent terms are radioactivity, high-energy radiation, atomic energy. It comes from the heart of the atom, originates in the nucleus, and is of two basic and different types, depending upon whether the radioactive atom is a particle emitter, alpha, beta or neutron, or a source of gamma radiation.

As far as effect on living tissue is concerned, it makes little difference which type of radiation is involved. Alpha, beta or neutron particles differ only quantitatively in their ionizing effects from each other and from the X ray type of gamma radiation. What does matter, and matter greatly, is the source of the radiation. Radiation from external sources differs greatly from internal radiation. The former can be directed to specific areas. The effects of the latter depend upon a combination of many factors: (1) The rate of decay of the radioactive material. (2) The amount of such material absorbed. (3) Its quality, i.e., whether it is an alpha, beta, gamma or neutron emitter. (4) How fast the body can get rid of it. (5) Where in the body it is concentrated.

Fundamentally, the problem consists of this: Ionization of tissue destroys the electrical balance of its components. The molecules, even the component atoms themselves, have their equilibrium upset. They are broken down into charged particles, positive and negative, called ions. It is the nature of an ion to seek its complement: the positive looks for a negative, eagerly searches for means to restore the balance of its electrical forces; and the negative ion will join with any positive ion it encounters. The union need not be a happy one for the body as a whole. New compounds, harmful and even poisonous can form, and the body suffers.

Now, the ionizing effect is a function of rate of radiation, and intensity of the source, and time of exposure. Physicists and biologists have defined two basic terms by which to measure the first two factors, the curie and the roentgen. The curie* is a completely arbitrary unit that defines the number of radioactive atoms that break down in a stated time interval. It is set equal to 3.7×10^{10} disintegrations per sec. This term is a little large for convenient handling, so two smaller units are commonly employed, the millicurie, or 1/1000 curie, and the microcurie or 3.7×10^{4} disintegra-

*It is understood that what follows is necessarily something of a simplification. For a brief but enlightening discussion of the curie, and the newer unit, the rutherford (rd), see *The Science and Engineering of Nuclear Power*. Vol. I, page 22.

tions per second. The specific advantage of having this unit is that it defines very precisely the total quantity of radiating material present. As opposed to the curie, which measures quantity, the Roentgen (r) is an energy term used specifically to measure X ray and gamma radiation. It is defined as 83.8 ergs per gram of dry air. Engineers may find it easier to picture this unit as 3.61×10^{-6} Btu per pound of dry air. To measure the energy of particle radiation a new term is derived—Roentgen Equivalent Physical (rep), which equals 83.8 ergs per gram of tissue. Since the energy loss for an r of gamma radiation in tissue normally will be greater than 83.8 ergs per gram, one r usually does not equal one rep.

It is a curious phenomenon of living beings that the whole is not even the tenth part of the sum of the parts in tolerance for radiation. For example, the LD-50 — lethal dosage for fifty percent of an average group —for whole body radiation in man is slightly in excess of 400 r. Yet dosages of 5,000 r are not infrequent in the radiation treatment of skin cancer. The point is that this dosage is concentrated on a small portion of the skin, about one-quarter of a square inch. Parenthetically, something to consider in this connection is the development of a machine capable of irradiating a sharply defined area only 1/25000th of an inch in diameter, soon to be used at the University of Chicago. This is an area approximately one-tenth the size of the normal somatic cell!

Herein lies the great advantage of a controlled source of external radiation—the possibility of sharply focusing the beam. A less extreme case is the use of X rays in studying certain parts of the body. A series of X rays taken of the kidneys and lower intestines may subject this area to a total dosage of something more than 40 r, yet ill effects from such radiation are rare. This points up another factor—namely that the period of time over which a given dosage is experienced has great influence on its effects on tissue.

As stated, whole body LD-50 for man is somewhat greater than 400 r, yet if this dosage were given in small amounts extending over a year, very little harm could be detected. The body has great powers of recovery.

Many elements enter into the effect of internal radiation upon the system. Once a radioactive substance has been absorbed its effects continue, cumulatively, as long as the substance is active and the body retains it, subject only to the amount —in curies—of the material, the nature of its activity, and whether or not it is concentrated in any particular portion of the body. Iodine, for instance, as is well known, concentrates in the thyroid gland to the extent of seven eighths of the total taken into the body. If the radioactive isotope were so concentrated, the r would be correspondingly localized and intensified. Sodium, on

the other hand, is not specific—as much will be found in one portion of the body as in another.

The effects of an isotope such as nickel, with a half life of thirty-six hours, will be greatly different from those of carbon-14 whose half life is approximately five thousand one hundred years. There are, of course, great differences in the rate of excretion of the different elements; Sodium is excreted almost as fast as it enters, whereas radium will enter and stay from then on, being deposited in the bone structure.

Plutonium, too, enters the bone structure to remain indefinitely, and interfere with the ability of the body to form new blood. It can be detected conveniently only by the methods of urinalysis, and since the amount of plutonium in the urine will rarely be more than 10^{-9} grams per day, regardless of the amount absorbed, the analysis must be very carefully performed.

It is claimed that plutonium is even more dangerous to man than radium. As of today, the most nearly effective treatment developed by the Argonne staff consists in the administration of zirconium. The mechanism is obscure but the result of this treatment is to increase the amounts excreted in the urine. The rate of increase is striking. If zirconium is taken within an hour of the plutonium injection, practically all the plutonium will have been excreted within a matter of minutes. Even should the treatment be delayed for from three days to a week, the use of zirconium results in a fifty-fold increase in the normal rate of disposal. Even so, it's a long period of recovery from plutonium poisoning, in some cases longer than a lifetime, and the possibilities of stream pollution from this source simply must be eliminated.

Experimental Psychology gives scientific confirmation of a generally known fact; namely, that too much of a good thing is no good, and that intensifying a source of pleasure can transform it into torture. This seems to be a general rule of nature: Nothing too much! Nowhere does this rule hold better than in the use of radioactive isotopes in medicine.

Radioactive iodine, for example, is given in small amounts to patients suffering from Graves disease—exophthalmic goiter—angina pectoris and congestive heart failure. Since it concentrates mainly in the thyroid, Graves disease is treated directly by depressing the activity of the gland; heart conditions are alleviated indirectly because lessening of the thyroid's activity cuts down on the demands on the heart.

Cobalt-60 has many advantages over the use of radium in treatment of cancer, not the least of which is its availability in several more or less pliable forms with varying degrees of activity, and also is being widely used in studies involving nucleic acid metabolism; radiophosphorous finds application in the field of blood disorders, especially leukemia and polycythemia.

But radiation can cause cancer as well as treat it, can cause glandular disturbances as well as relieve them, can bring about blood disorders as well as cure them. Atmospheric and stream pollution became a most important hurdle on the road to the application of the principles of nuclear power.

One danger that was in the foreground of the investigators was the possibility engendered by the tendency of life forms to concentrate scattered elements—the tendency that has caused life to be described as negative entropy. In the case of stream and river pollution, did a possibility exist that one life form, say algae, would absorb some radioactive material and concentrate it, be absorbed by another life form which would further concentrate the radioactivity, then by another and so on until it would wind up in man? The concept was not farfetched. Remember that iodine in the sea is present in concentrations too low to make direct recovery profitable. Certain types of sea weed, however, perform the extraction readily enough, and concentrate it sufficiently to support a very profitable business. Zirconium is present in sea water in concentrations in the order of 10^{-6}, yet some sea creatures find it indispensable and have no difficulty in obtaining enough for their needs. No, the danger was a definite possibility.

Even now the evidence is not all in. But the indications are that such concentration does not occur. The first step might, and even the second, but from there on the localization of certain chemicals in certain parts of the organism takes over, and the greatest concentrations appear to be within the bone structure, the nonedible portions of the fish.

It should now be clear that the real problem was not the total elimination of radioactivity from all waste —although that remains the desideratum—but rather the holding of radiation to safe limits beyond the possibility of dangerous reconcentration. The Health Physicists went to work on this problem, and the first item they tackled was, of course, the determination of what "safe limits" meant when expressed as curies and reps.

There are anywhere from six hundred to eight hundred radioisotopes of the elements of the periodic table, each of which has a different level of activity. Some are particle emitters, some are gamma ray radiators, all must be investigated. It's a terrific job these men have done and continue to do against heavy odds and in the face of overwhelming time pressure. The men of the Health Physicist group deserve far more credit than is generally given them.

Working frequently with sparse data, often dealing with mixtures of many different radioactive isotopes, they had the terrible responsibility of setting the limits to radiation levels that could be permitted in the streams, in the atmosphere without danger to you.

For the most part they worked by

extrapolation of known effects produced by X ray and gamma radiation in the biological and medical laboratories. Laboratory animals, white mice and rats, hamsters, guinea pigs, bats—which are mammals, yet their wings are thinner than fine tissue paper and hence permit direct observation of the effect of radiation on blood circulation—were and are being subject to varying amounts and kinds of irradiation. Always, in applying their findings to the human race, the thought was ever uppermost that whatever they found could only be an approximation. Species differ so widely in their tolerance for various forms of radioactivity that extreme care must be exercised in the interpretation of results. Consider, for example, the case of radium poisoning.

The animals tested would appear to the nonspecialist to be far more resistant to the effects of radium inhalation than man. Without the knowledge gained through the painful burns and skin lesions and cancers of the technicians of the early days of radiation study, it would appear that the permissible level for radium could be set far higher than is actually safe. Behind the apparent discrepancy is the curious fact that long periods of time are required for the full effects of radium poisoning to make themeslves felt, sometimes decades, and rats and guinea pigs do not have a life span of sufficient length.

But with all that, there is still a great difference in the resistivity of the various species: The LD-50 for man has already been stated to be slightly greater than 400 r; for the rat the LD-50 lies between 825 and 900 r; whereas for the guinea pig, the LD-50 is only 250 r. So the Health Physicist had to consider variation in tolerance from species to species in setting up his tolerable limits.

Notice also that life is a chain, and that no one can say with confidence that there is any species that does not have some influence upon every other species. The tolerance levels must be so set that not only would man and his domestic animals be unharmed by possible concentrations, but nothing must be done that would upset the balance of Nature.

A realistic approach to the problem also had to concern itself with natural radiation background. All of us are subject to radiation no matter where we live. Our planet is constantly being bombarded with cosmic rays, and certain amounts of gamma and particle radiation are experienced in every locality. The activity level may be low, but it is significant. For instance, in the neighborhood of sea level a person normally receives about 2 to 3 r of radiation in the course of his life; in the neighborhood of Denver the dosage runs somewhat better than 20 r. The criterion to be followed, therefore, was that the amount of radiation contributed to the surroundings be not significantly greater than the

amount of total background radiation.

Limits for discharge to potable water were set at 10^{-5} microcuries per cc.; 10^{-8} microcuries per cc. is the standard permissible limit for air. These limits contain a large safety factor, ranging from 10 to 100.

The normal person can easily withstand a daily amount of irradiation amounting to about 1 r without serious effects. Applying a safety factor of 10, the maximum amount tolerated per employee at any of the atomic centers was set at 0.1 r per day, and this has recently been lowered to 0.3 r per week because some slight enlargement of the ovaries of mice occurred at a daily dosage of 0.5 r per day.

Fundamentally, there are only two possible ways of controlling the amount of radioactivity discharged to nature in the waste products of our nuclear plants. It is a disconcerting fact that radioactivity can only be discharged by time. Man can do nothing to hurry the process. He can do only one of two things: (1) He can dilute and disperse, or, (2) he can confine and control.

It hasn't often been stressed, but the best place to hide a needle is not in a haystack but in a needle factory. Similarly with the dilution of radioactive isotopes; the best diluent is their stable form. A numerical example will make this clear.

Let us assume that the permissible level of radiation for a given isotope is twenty-four microcuries in the organ of maximum concentration, and that this organ contains four hundred grams of the chemical element. If the two forms of the element are uniformly distributed, then the dilution ratio of 400/24, or 16.7 grams of stable isotope per microcurie of radioisotope would make it impossible for greater than the permissible radiation to take place. If radioactive carbon dioxide is being discharged up a stack, dilution with the stable, ordinary form of this gas is far and away the best method for preventing dangerous concentrations.

When gaseous wastes are vented to the atmosphere without such dilution, the off-gases are very carefully monitored, and meteorological conditions must be such as to insure maximum dilution. The author recently visited Brookhaven to observe their methods of control of atmospheric pollution, since his own industry has somewhat similar problems. He was amazed at the thoroughness of the meteorological group's approach to this problem, and the advances which they have made even over Sutton's* mathematical approach to the problem. Based on their continuing study of atmospheric conditions they have found that it would take a backlog of six or seven days of very adverse weather to force a change in the re-

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*"The Theoreticol Distribution Of Airborne Pollution From Foctory Chimneys" *Quarterly Journal of the Royal Meteorologicol Society*, V. 73, pp. 426-436, 1947.

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actor operation schedule. Naturally, the coolant air is filtered both before passing through the pile and after, so that the major radioactive material present in any case is the shortlived radio-argon.

The handling of liquid wastes presents some problems that are unique, and one potentially very important means of removing dangerous contamination from streams.

The chief sources of liquid waste have already been indicated to be cooling water, chemical processing for recovery of fission products and laboratory spills. The aim here is to achieve the proper conditions of dilution so that dispersion becomes permissible. Dilution of the radioactive material is accomplished when possible by simply decay of the isotope in storage. When sufficient half lives have passed, and check with instruments provides assurance that the material has cooled sufficiently, it is simply discharged. When this is not possible, other techniques must be used, one of the most important being the same basic type as is becoming more and more important in the production of industrial water—the use of ion exchange which permits concentration to a volume more suitable for storage. When other types of treatment fail to reduce the activity of the waste to a satisfactory degree, the only remaining solution is to store the material indefinitely. It is readily seen that this is expensive, and better means of disposal are constantly sought.

The cooling water irradiated during the operation of the Hanford pile is held in a retention basin under carefully monitored conditions, and not until the level of activity is reduced to permissible limits is the water returned to the Columbia River.

It may be of interest to note that the actual degree of contamination of streams is usually much below the level of activation of the monitoring instruments. In this case, the technique is to obtain a sample of given volume and evaporate this down to a concentration that permits a reading to be taken. When this has been accomplished, the actual activity level in the stream is computed by simple ratio.

Incidentally, although the principle of the Geiger counter and similar instruments is too well known to justify discussion here, it is worth observing that its use is not as simple as one might expect. At Oak Ridge, for instance, they claim that it takes at least a month to learn how to use one properly and to interpret what it says correctly. Monitoring is not a job for the amateur.

Biological treatment of contaminated waters is of increasing interest. This is a treatment borrowed from the sanitary engineer's techniques of treating sewage. It involves the use of activated sludge, i.e., sludge containing aerobic microorganisms which digest the raw sewage. In atomic plant waste disposal, the sludge is made up of a gelatinous mass in which great colo-

nies of bacteria are imbedded. The membranes of the bacteria are greatly swollen by the absorption of water, hence they offer a very large surface area suitable for the capture of radioactive isotopes. As an example of what may be accomplished by this means, research indicates that a two-stage process of this nature will extract ninety-nine percent of plutonium from liquid wastes. The potentialities of this method of treatment are obviously enormous, but as yet they have not been thoroughly explored.

The problems associated with the disposal of the various types of waste are very closely interrelated. In some cases, laboratory equipment may be decontaminated by washing with citric acid, peroxide and/or permanganate. This is obviously not a solution; it is merely a transfer of the problem from one phase to another, where it may be handled by any of the methods outlined above.

The techniques of confinement and control are most generally applicable to solid waste material. If the solid is not itself radioactive but merely contaminated with radioactive materials, the possibility of decontamination exists. Where this is not possible, all that remains is (1) to segregate the waste and let it decay under carefully monitored conditions, or (2), get rid of the material in the safest manner possible.

This last might be achieved by dilution in concrete and burying in the sea, or concentration by evaporation, ion exchange, precipitation, incineration under proper conditions and encasing the residue in some suitable medium and planting deep in the ground under carefully supervised controls.

In a world which will soon see the achievement of the hydrogen bomb, the great concern that exists over a few curies of activity that may arise from operation of the nuclear reactors is somewhat amusing. However, the quickest way to develop neuroses is to start worrying over what may happen. Let it be sufficient to know that the present problem does not present any insuperable difficulties, and that more thought is now being given to the problem than to any similar health contingency.

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Note: The fact there is not very much available in this specific field has encouraged the author to write this paper. Dr. Aebersold told the group at the Seminar on the Disposal of Radioactive Wastes, in January of last year, "If you write a little bit on it, a little bit of knowledge is liable to be an important thing."

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1.—"Industrial Uses of Radioactive Materials." A selected Bibliography. Arthur D. Little, Inc., Cambridge 42, Mass. Note: The Arthur D. Little, Inc. has prepared this very useful bibliography for those interested in the applications of radioisotopes to various fields of industry. It is a very excellent reference to have in your library.

THE END

(Continued from Page 5)

see you use a little different technique than I do, but I always knew hypnosis was the answer—"

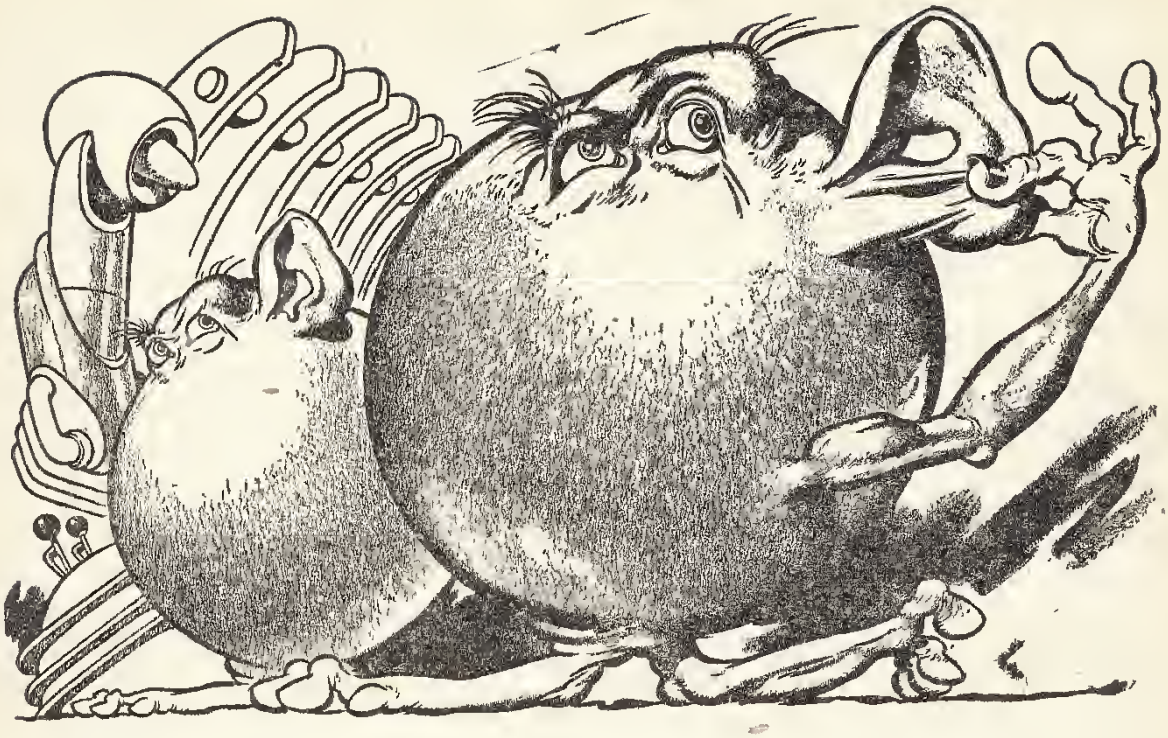
The fact that dianetics does *not* use hypnotic therapy, that dianetic therapy is precisely, exactly the opposite of hypnosis, does not fit his previous set of concepts; because hypnosis was used as a research tool in formulating dianetics, he hobson-jobsons dianetics entirely into his previous concepts. Hypnotic therapy attempts to plant commands; in exact reverse, the whole principle of dianetic therapy is to *remove* commands, to break the hypnoticlike command of unconscious experiences.

Similarly, the psychoanalyst, told about dianetics, nods and tends to say, "Yes—that's the basic idea of Freudian psychoanalysis. You remember Freud and Breuer started using hypnotic techniques, and dropped it as unsatisfactory. You seem to have a somewhat improved technique. But your methods are along. The patient must learn to face just what we've been using right the reality of his memories and understand the symbolic values of them—"

Hobson-jobson at work. Freud started trying to use hynotherapy; it doesn't work. Hypnoanalysis still doesn't work. But the psychoanalyst tends to miss—because he has been trained to an exactly opposite viewpoint—the critical point in dianetics. A neurotic patient's behavior is *not* symbolic; it is exactly, literally carrying out a precise and specific command. And it's amazing how far off the track you can go if you insist that a literal statement is symbolic.

More important; the next time you are trying to explain your specialty to someone in another line, look for that intellectual hobson-jobsonism. You'll probably find it. And knowing it's there, you can quickly find out why your explanation isn't making sense to the other fellow!

THE EDITOR.



EXPOSURE

BY ERIC FRANK RUSSELL

The spies sent out by a malleable race like theirs were practically proof against exposure. They could imitate anything! Which could have been tough for Earth—

Illustrated by Cartier

The Rigelian ship came surreptitiously, in the deep of the night. Choosing a heavily forested area, it burned down a ring of trees, settled in the ash, sent out a powerful spray of liquid to kill the fires still creeping outward through the undergrowth.

Thin coils of smoke ascended from dying flames. Now adequately concealed from all directions but immediately above, the ship squatted

amid towering conifers while its tubes cooled and contracted with metallic squeaks. There were strong smells of wood smoke, pine resin, acrid flame-killer and superheated metal.

Within the vessel there was a conference of aliens. They had two eyes apiece. That was their only positive feature: two eyes. Otherwise they had the formlessness, the almost liquid sloppiness of the completely malleable. When the three in the chart room consulted a planetary photograph they gestured with anything movable, a tentacle, pseudopod, a long, stump-ended arm, a mere digit, anything that struck their fancy at any given moment.

Just now all three were globular, shuffled around on wide, flat feet and were coated with fine, smooth fur resembling green velvet. This similarity was due to politeness rather than desire. During conversation it is conventional to assume the shape of one's superior and, if he changes, to change with him.

So two were spherical and furry solely because Captain Id-Wan saw fit to be spherical and furry. Sometimes Id-Wan was awkward. He'd give himself time to do a difficult shape such as that of reticulated molobater then watch them straining their innards in an effort to catch up.

Id-Wan said: "We've recorded this world from far out on its light side and not a spaceship came near to challenge our presence. They have no spaceships." He sniffed expressively and went on, "The blownup pictures are plenty good enough for our purpose. We've got the lay of the land and that's as much as we need."

"There appears to be a lot of sea," remarked Chief Navigator Bi-Nak, peering at a picture. "Too much sea. More than half of it is sea."

"Are you again belittling my conquests?" demanded Id-Wan, producing a striped tail.

"Not at all, captain," assured Bi-Nak, dutifully imitating the tail. "I was simply pointing out—"

"You point too much," snapped Id-Wan. He turned to the third Rigelian. "Doesn't he, Po-Duk?"

Pilot Po-Duk played safe by remarking, "There are times and there are times."

"That is truly profound," commented Id-Wan, who had a robust contempt for neutrals. "One points while the other functions as a fount of wisdom. It would be a pleasant change if for once you did the pointing and let Bi-Nak be the oracle. I could stand that. It would make for variety."

"Yes, captain," agreed Po-Duk.

"Certainly, captain," indorsed Bi-Nak.

"All right." Id-Wan, turning irritably to the photographs, said: "There are many cities. That means intelligent life. But we have seen

no spaceships and we know they've not yet reached even their own satellite. Hence, their intelligence is not of high order." He forced out a pair of mock hands so that he could rub them together. "In other words, just the sort of creatures we want—ripe for the plucking."

"You said that on the last planet," informed Bi-Nak whose strong point was not tact.

Id-Wan pulled in his tail and bawled, "That was relative to worlds previously visited. Up to that point they were the best. These are better."

"We haven't seen them yet."

"We shall. They will give us no trouble." Id-Wan cooled down, mused aloud, "Nothing gives us trouble and I doubt whether anything is capable of it. We have fooled half a hundred successive life forms, all utterly different from any known in our home system. I anticipate no difficulties with another. Sometimes I think we must be unique in creation. On every world we've explored the creatures were fixed in form, unchangeable. It would appear that we alone are not the slaves of rigidity."

"Fixedness of form has its advantages," denied Bi-Nak, a glutton for punishment. "When my mother first met my father in the mating-field she thought he was a long-horned nodus, and—"

"There you go again," shouted Id-Wan, "criticizing the self-evident." Sourly, Id-Wan turned back to the photographs, indicated an area toward the north of a great land-mass. "We are located there, well off the beaten tracks, yet within individual flying distance of four medium-sized centers. The big cities which hold potential dangers—though I doubt any real dangers—are a good way off. Nearer villages are too small to be worth investigating. The medium-sized places are best for our purpose and, as I've said, there are four within easy reach."

"Which we'll proceed to inspect?" suggested Po-Duk, mostly to show that he was paying attention.

"Of course. The usual tactics—two scouts in each. One day's mixing among the natives and they'll get us all we need to know, while the natives themselves learn nothing. After that—"

"A demonstration of power?" asked Po-Duk.

"Most certainly." Id-Wan extended something like a hair-thin tentacle, used it to mark one of the four near towns. "That place is as good as any other. We'll scrape it clean off Earth's surface, then sit in space and see what they do about it. A major blow is the most effective way of persuading a world to reveal how highly it is organized."

"If the last six planets are anything to go by," ventured Po-Duk, "we won't see much organization here. They'll panic or pray or both."

"Much as we did when the Great

Spot flared in the year of—" began Bi-Nak. His voice trailed off as he noted the gleam in Id-Wan's eyes.

Id-Wan turned to Po-Duk: "Summon the chief of the scouts and tell him to hurry. I want action." Staring hard at Bi-Nak, he added, "Action—not talk!"

The fat man whose name was Ollie Kampenfeldt waddled slowly through the dark toward the log hut whence came the thrum of a guitar and the sound of many voices. He was frowning as he progressed, and mopping his forehead at regular intervals.

There were other log huts scattered around in the vicinity, a few showing lights, but most in darkness. A yellow moon hung only a little above the big stockade of logs which ran right round the encampment; it stretched the shadows of the huts across neatly trimmed lawns and grassy borders.

Kampenfeldt lumbered into the noisy hut and yelped in shrill tones. The guitar ceased its twanging. The talking stopped. Presently the lights went out. He emerged accompanied by a small group of men most of whom dispersed.

Two stayed with him as he made toward the building nearest the only gate in the heavy stockade. One of them was expostulating mildly.

"All right. So guys need sleep. How were we to know it was that late? Why don'tcha put a clock in the place?"

"The last one got snitched. It cost me fifty."

"Hah!" said the grumbler. "So time doesn't matter. What do I care about it? There's plenty of it and I'm going no place. Make less noise and get to bed. We've got no clock because the place is full of thieves. You'd think I was back in the jug."

His companion on the other side of Kampenfeldt perked up with sudden interest. "Hey, I didn't know you'd been in clink."

"After ten years on the night beat for a big sheet you've been everywhere," said the first. "Even in a crackpotorium—even in a cemetery, for that matter." Then he stopped his forward pacing, raised himself on his toes, stared northward. "What was *that?*"

"What was what?" inquired Kampenfeldt, mopping his brow and breathing heavily.

"Sort of ring of brilliant red light. It floated down into the forest."

"Meteor," suggested Kampenfeldt, not interested.

"Imagination," said the third, having seen nothing.

"Too slow for a meteor," denied the observer, still peering on tiptoe at the distant darkness. "It floated down, like I said. Besides, I've never heard of one that shape or color. More like a plane in flames. Maybe it was a plane in flames.

"We'll know in an hour," promised Kampenfeldt, a little disgrun-

tled at the thought of further nighttime disturbances.

"How?"

"The forest will be ablaze on a ten-mile front. It's drier than I've ever known it, and ripe for the kindling." He made a clumsy gesture with a fat hand. "No fire, no plane."

"Well, what else might it be?"

Kampenfeldt said wearily: "I neither know nor care. I have to get up in the morning."

He waddled into his hut, yawning widely. The others stood outside a short time and stared northward. Nothing extraordinary was visible.

"Imagination," repeated one.

"I saw something queer. Dunno what could be out there in all that timber, but I saw something—and I've got good eyes." He removed his gaze, shrugged. "Anyway, the heck with it!"

They went to bed.

Captain Id-Wan gave his orders to the chief of the scouts. "Bring in some local life forms. The nearest and handiest will do providing they're assorted, small and large. We want to test them."

"Yes, captain."

"Collect them only from the immediate neighborhood. There is a camp to the south which undoubtedly holds superior forms. Keep away from it. Orders concerning that camp will be given you after the more primitive forms have been tested."

"I see, captain."

"You do not see," reproved Id-Wan. "Otherwise you would have noted that I have created flexible digits upon my feet."

"I beg your pardon, captain," said the chief, hastening to create similar extensions.

"The discourtesy is overlooked, but do not repeat it. Send in the head radio technician, then get on with your task."

To the radio officer, who made toes promptly, he said: "What have you to report?"

"The same as we noted upon our approach—they fill the air."

"What?" Id-Wan pulled surprisedly at an ear which he had not possessed a moment before. The ear stretched like soft rubber. "I was not informed of that during the approach."

"I regret, I forgot to—" commenced Bi-Nak, then ceased and strained himself before Id-Wan's eyes could catch him without a rubber ear.

"They fill the air," repeated the radio technician, also dutifully eared. "We've picked up their noises from one extreme to the other. There seems to be at least ten different speech patterns."

"No common language," Bi-Nak mourned. "That complicates matters."

"That simplifies matters," Id-Wan flatly contradicted. "The scouts can masquerade as foreigners and thus avoid speech troubles. The Great

Green God could hardly have arranged it better."

"There are also other impulse streams," added the technician. "We suspect them of being pictorial transmissions."

"Suspect? Don't you *know?*"

"Our receivers cannot handle them, captain."

"Why not?"

The radio officer said patiently: "Their methods do not accord with ours. The differences are technical. To explain them would take me a week. In brief, our receivers are not suitable for their transmitted pictures. Eventually, by trial and error methods, we could make them suitable, but it would take a long time."

"But you do receive their speech?"

"Yes—that is relatively easy."

"Well, it tells us something. They've got as far as radio. Also, they're vocal and therefore unlikely to be telepathic. I would cross the cosmos for such bait." Dismissing the radio officer, he went to the lock, looked into the night-wrapped forest to see how his scouts were doing.

His strange Rigelian life-sense enabled him to detect their quarry almost at a glance, for life burned in the dark like a tiny flame. There was just such a flame up a nearby tree. He saw it come tumbling down when the paralyzing dart from a scout's gun struck home. The flame flickered on landing but did not die out. The hunter picked it up, brought it into the light. It was a tiny animal with prick ears, coarse, reddish fur and a long, bushy tail.

Soon eight scouts struggled in bearing a huge, thickly-furred form of ferocious aspect. It was big-pawed, clawed and had no tail. It stank like molobater blood mixed with aged cheese. Half a dozen other forms were brought in, two of them winged. All were stiffened by darts, had their eyes closed, were incapable of movement. All were taken to the examiners.

One of the experts came to Id-Wan in due course. He was red-smeared and had an acrid smell.

"Nonmalleable. Every one of them."

"Bhingho!" exclaimed Id-Wan. "As are the lower forms, so will be the higher."

"Not necessarily, but very probably," said the expert, dodging the appearance of contradiction.

"We will see. Had any of these creatures possessed the power of imitative and ultra-rapid reshaping, I should have had to modify my plans. As it is, I can go right ahead."

The other responded, "So far as can be judged from these simple types you should have little trouble with their betters."

"That's what I think," agreed Id-Wan. "We'll get ourselves a sample."

"We need more than one. Two at least. A pair of them would enable us to determine the extent to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which individuals differ. If the scouts are left to draw upon their own imaginations in creating differences, they may exaggerate sufficiently to betray themselves."

"All right, we'll get two," said Id-Wan. "Call in the chief of the scouts."

To the chief of the scouts, Id-Wan said: "All your captures were of unalterable form."

"Excellent!" The chief was pleased.

"Pfah!" murmured Bi-Nak.

Id-Wan jerked around. "What was that remark?"

"Pfah, captain," admitted Bi-Nak, mentally cursing the efficiency of the rubber ear. As mildly as possible, he added, "I was considering the paradox of rigid superiority, and the pfah popped out."

"If I were telepathic," answered Id-Wan, very deliberately, "I would know you for the liar you are."

"Now there's something," offered Bi-Nak, sidetracking the insult. "So far we've encountered not one telepathic species. On this planet there are superior forms believed to be rigid—so whence comes their superiority? Perhaps they are telepathic."

Id-Wan complained to the chief scout, "Do you hear him? He points and pops out and invents obstacles. Of all the navigators available I had to be burdened with this one."

"What could be better could also be worse," put in Po-Duk, for no reason whatsoever.

Id-Wan yelled, "And this other one hangs around mouthing evasions." His fur switched from green to blue.

They all went blue, Po-Duk being the slowest. He was almost a color-cripple, as everyone knew. Id-Wan glared at him, swiftly changed to a reticulated molobater. That caught all three flat out. Id-Wan excelled at molobaters and gained much satirical satisfaction from their mutual writhings as each strove to be first. "See," he snapped, when finally they had assumed the new shape. "You are not so good, any of you."

"No, captain, we are very bad," indorsed Bi-Nak, oozing the characteristic molobater stench.

Id-Wan eyed him as if about to challenge the self-evident, decided to let the matter drop, returned his attention to the chief of the scouts. He pointed to the photographs. "There is that encampment a little to our south. As you can see, it is connected by a long, winding path to a narrow road which ambles far over the horizon before it joins a bigger road. The place is pretty well isolated; that is why we picked it."

"Picked it?" echoed the chief.

"We chose it and purposefully landed near it," Id-Wan explained. "The lonelier the source of samples, the less likelihood of discovery at the start, and the longer before an alarm can be broadcast."

"Ah," said the chief, recovering the wits strained by sudden molobating. "It is the usual technique. We are to raid the camp for specimens?"

"Two of them," confirmed Id-Wan. "Any two you can grab without rousing premature opposition."

"That will be easy."

"It cannot be otherwise. Would we be here, doing what we are doing, if all things did not come easy to our kind?"

"No, captain."

"Very well. Go get them. Take one of the radio technicians with you. He will first examine the place for signs of a transmitter or any other mode of ultra-rapid communication which cannot be detected on this photograph. If there proves to be a message-channel, of any sort at all, it must be put out of action, preferably in a manner which would appear accidental."

"Do we go right now?" asked the chief. "Or later?"

"At once, while it remains dark. We have observed how their cities dim by night, watched their lights go out, the traffic thin down. Obviously they are not nocturnal. They are most active in the daytime. Obtain those samples now and be back here before dawn."

"Very well, captain." The chief went out, still a molobater, but not for long.

Bi-Nak yawned and remarked, "I'm not nocturnal either."

"You are on duty," Id-Wan reminded him severely, "until I see fit to say that you are not on duty. And furthermore, I am disinclined to declare you off duty so long as I remain at my post."

"Example is better than precept," approved Po-Duk, currying favor.

Id-Wan promptly turned on him and bawled, "Shut up!"

"He was only pointing out," observed Bi-Nak, picking his not-teeth with fingers that weren't.

Kampenfeldt lumbered with elephantine tread to where three men were lounging full length on the grass. He wiped his forehead as he came, but it was from sheer habit. The sun was partway up and beginning to warm. The cool of the morning was still around. Kampenfeldt wasn't sweating, nevertheless he mopped.

One of the men rolled lackadaisically onto one side, welcomed him with, "Always on the run, Ollie. Why don'tcha flop down on your fat and absorb some sun once in a while?"

"Never get the chance." Kampenfeldt mopped, looked defeated. "I'm searching for Johnson and Greer. Every morning it's the same—somebody's late for breakfast."

"Aren't they in their hut?" inquired a second man, sitting up with an effort and plucking idly at blades of grass.

"Nope. First place I looked. Must've got up mighty early be-

cause nobody saw them go. Why won't guys tell me they're going out and might be late? Am I supposed to save something for them or not?"

"Let 'em do without," suggested the second man, lying down again and shading his eyes.

"Serves them right," added the first.

"They're not anywhere around," complained Kampenfeldt, "and they didn't go out the gate."

"Probably climbed the logs," offered one. "They're both batty. Most times they climb the logs when they go moonlight fishing. Anyone who wanders around like that in the middle of the night has got a hole in his head." He glanced at the other. "Were their rods in the hut?"

"Didn't think to look," admitted Kampenfeldt.

"Don't bother to look. They like to show they're tough. Let 'em be tough. It's a free country."

"Yeah," admitted Kampenfeldt reluctantly, "but they ought to have told me about their breakfasts. Now they'll be wasted unless I eat them myself."

They watched him waddle away, still worried, and mopping himself at regular intervals.

One said: "That silhouette shows there isn't much wasted."

Another said: "Hah!", shaded his eyes with one hand and tried to look at the sun.

An examiner appeared, red-smeared and acrid-smelling as before. "They're like all the others—fixed."

"Unalterable?" insisted Id-Wan.

"Yes, captain." Distastefully he gazed down at the lurid stains upon himself, added, "Eventually we separated them, putting them in different rooms, and revived them. We killed one, then the other. The first fought with his limbs and made noises, but displayed no exceptional powers. The other one, in the other room, was already agitated but did not become more so during this time. It was obvious that he had no notion of what was happening to his companion. We then killed him after he had resisted in the same manner. The conclusion is that they are neither hypnotic nor telepathic. They are remarkably ineffectual even at the point of death."

"Good!" exclaimed Id-Wan, with great satisfaction. "You have done well."

"That is not all, captain. We have since subjected the bodies to a thorough search and can find no organs of life-sense. Evidently they have no way of perceiving life."

"Better still," enthused Id-Wan, "no life-sense means no dynamic receivers—no way of tuning an individual life and tracing its whereabouts. So those in the camp cannot tell where these two have gone."

"They couldn't in any case, by this time," the other pointed out, "since both are dead." He tossed a couple

of objects onto a table. "They had those things with them. You may wish to look at them."

Id-Wan picked up the articles as the examiner went away. They were a pair of small bags or satchels made of treated animal hide, well finished, highly polished, and attached to adjustable belts.

He tipped out their contents upon the table, pawed them over: A couple of long, flat metal cases containing white tubes stuffed with herbs. Two metal gadgets, similar but not the same, which could be made to spark and produce a light. A thin card with queer, wriggly writing on one side and a colored picture of a tall-towered city on the other. One small magnifying glass. Two writing instruments, one black, the other silvery. A crude time meter with three indicators and a loud tick. Several insectlike objects with small, sharp hooks attached. Four carefully folded squares of cloth of unknown purpose.

"Humph!" He scooped the lot back, tossed the satchels to Po-Duk. "Take them to the workshop, tell them to make six reasonably good copies complete with contents. They must be ready by next nightfall."

"Six?" queried Po-Duk. "There will be eight scouts."

"Imbecile! You are holding the other two."

"So I am," said Po-Duk, gaping fascinatedly at the objects as if they had just materialized from thin air.

"There are times and there are times," remarked Bi-Nak as Po-Duk departed.

Id-Wan let it pass. "I must have a look at these bodies. I am curious about them." He moved off to the operating room, Bi-Nak following.

The kidnaped and slaughtered creatures proved to be not as repulsive as some they'd found on other worlds. They lay side by side, long, lean, brown-skinned, with two arms, two legs, and with dark, coarse hair upon their heads. Their dead eyes were very much like Rigelian eyes. Their flesh was horribly firm despite that it was full of red juice.

"Primitive types," pronounced Id-Wan, poking at one of them. "It's a marvel they've climbed as high as they have."

"Their digits are surprisingly dexterous," explained the head examiner. "And they have well-developed brains, more so than I had expected."

"They will need all their brains," promised Id-Wan. "We are too advanced to be served by idiots."

"That is true," indorsed Bi-Nak, gaining fresh heart.

"Although sometimes I wonder," added Id-Wan, staring hard at him. He shifted his attention back to the examiner: "Give these cadavers to the scouts and tell them to get in some practice. I'll pick out the eight best imitators tonight. They had better be good!"

"Yes, captain."

The sinking sun showed no more than a sliver of glowing rim on a distant hill when the chief of the scouts reported to Id-Wan. There was a coolness creeping over the land, but it was not coldness. Here, at this time, the nights were merely less warm than the days.

Id-Wan inquired: "Did you have any difficulty in obtaining those two specimens this morning?"

"No, captain. Our biggest worry was that of getting there before broad daylight. It took longer than we'd anticipated to reach the place. In fact dawn was already showing when we arrived. However, we were lucky."

"In what way?"

"Those two were already outside the camp, just as if the Great Green God had provided them for us. They bore simple apparatus for trapping water game and evidently intended an early morning expedition. All we had to do was plant darts in them and take them away. They had no chance to utter a sound. The camp slumbered undisturbed."

"And what about the message channels?"

"The technician could find none," said the chief. "No overhead wires, no underground cables, no antenna, nothing."

"That is peculiar," remarked Bi-Nak. "Why should creatures so forward be so backward? They *are* superior types, aren't they?"

"They are relatively unimportant in this world's scheme of things," declared Id-Wan. "Doubtless they serve these trees in some way, or watch for fires. It is of little consequence."

"Sitting down on their dirt is not of little consequence," grumbled Bi-Nak to himself. "I'll be happier after we've blasted one of their towns, or ten of them, or fifty. We can then get their reaction and beat it home with the news. I am more than ready to go home even if I am chosen to return with the main fleet sometime later."

"Are the scouts ready for my inspection?" Id-Wan asked the chief.

"Waiting now, captain."

"All right, I'll look them over." Going to the rear quarters, he studied the twenty Rigellians lined up against a wall. The two corpses reposed nearby for purposes of comparison. Subjecting each scout to long and careful scrutiny, he chose eight, whereupon the remaining twelve promptly switched to his own shape. The eight were good. Four Johnsons and four Greers.

"It is a simple form to duplicate," commented the chief. "I could hold it myself for days on end."

"Me, too," agreed Id-Wan. He addressed the row of two-armed, brown-skinned bipeds who could be whatever he wanted them to be. "Remember the most stringent rule:

In no circumstances will you change shape before your task is done. Until then, you will retain that precise form and appearance, even under threat of destruction."

They nodded silently.

He continued, "All your objectives have large parks into which you will be dropped shortly before dawn. You will then merge as inobtrusively as possible with the creatures appearing in each awakening town. After that, do as you've done many a time before—dig up all the useful data you can get without arousing suspicion. Details of weapons and power sources are especially needed. Enter no building until you are sure that your entry will not be challenged. Do not speak or be spoken to if it is avoidable. In the last resort, respond with imitations of a different speech pattern."

"Fanziki moula? Sfinadacta bu!" said Bi-Nak, concocting an example.

Id-Wan paused to scowl at him before he went on, "Above all, be circumspect. Don't let zeal tempt you into betrayal. After all, there are eight of you, and one may find what another has missed."

They nodded again, bipeds all of them, but with the Rigelian lifeflame burning within them.

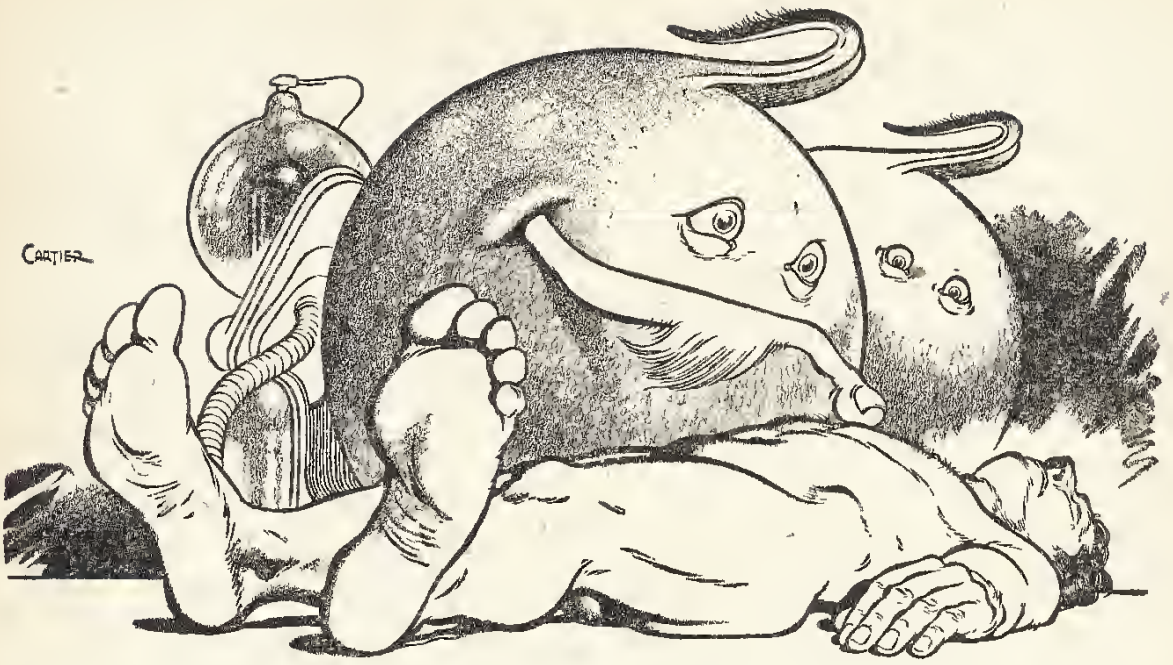
He finished, "If absolutely imperative, give up the quest and hide yourselves until the time for return. Be at your respective dropping-points in the parks at the mid-hour of the following night. You will then be picked up." He raised his voice in emphasis. "And do not change shape before then!"

They didn't. They had not altered by as much as one hair when they filed impassively into the ship's lifeboat between the mid-hour and dawn. Id-Wan was there to give them a final look over. Each walked precisely as the now-dead samples had walked, swinging his arms in the same manner, using the same bearing, wearing the same facial expression. Each had a satchel complete with alien contents, plus a midget dart-gun.

The lifeboat rose among the trees, into the dark, bore them away. A few creatures in the trees resented the brief disturbance, made squawking sounds.

"Not one other ship in the night," remarked Id-Wan, looking upward. "Not one rocket trail across the stars. They've got nothing but those big, clumsy air machines which we saw toiling through the clouds." He gave a sigh. "In due time we'll take over this planet like taking a karda-fruit from a nodus. It is all too easy, too elementary. Sometimes I feel that a little more opposition might be interesting."

Bi-Nak decided to let that point go for what it was worth, which wasn't much. Two days and nights on continual duty with the indefatigable Id-Wan had tired him beyond argument. So he yawned, gave the stars a sleepless, disinterested eye,



and followed Id-Wan into the ship.

Making for the dynamic receivers, Id-Wan had a look at their recording globes each of which had been tuned to a departing scout. Each globe held a bright spot derived from a distant life-glow. He watched the spots shrink with distance until eventually they remained still. A bit later the lifeboat came back, reported all landed. The spots continued to shine without shifting. None moved until the sun stabbed a red ray in the east.

Planting another filled glass on the tray, Ollie Kampenfeldt gloomed at a night-shrouded window and said: "It's been dark two hours. They've been gone all day. No breakfast, no dinner, no supper, nothing. A feller can't live on nothing. I don't like it."

"Me neither," approved somebody. "Maybe something's happened."

"If one had broken his leg or his neck, the other would be here to tell us," another pointed out. "Besides, if it were anyone else, I'd suggest a search for them. But you know those two coots. Isn't the first time Johnson and Greer have taken to the jungle. Reckon they've seen too many Tarzan pictures. Just a pair of overgrown, muscle-bound kids."

"Johnson's no kid," denied the first. "He's an ex-navy heavyweight who still likes to jump around."

"Aw, probably they've got lost. It's the easiest thing in the world to get lost if you wander a bit. Four times I've had to camp out all night, and—"

"I don't like it," interjected Kampenfeldt, firmly.

"O. K., you don't like it. What are you going to do about it? Phone

the cops?"

"There's no phone, as you know," said Kampenfeldt. "Who'd drag a line right up here?" He thought it over, frowning fatly, and wiped his forehead. "I'll give 'em to morning. If they're not back by then, I'll send Sid on his motorcycle to tell the forest rangers. Nobody's going to say I did nothing about it."

"That's the spirit, Ollie," one of them approved. "You look after nature's children and they'll look after you."

Several laughed at that, heartily. Within half an hour Johnson and Greer were forgotten.

It was early in the afternoon when the tracer operators rushed into the main cabin and so far forgot themselves as not to match Id-Wan's shape. Remaining rotund, tentacular and pale purple, the leading one of the three gestured excitedly as he spoke.

"Two have gone, captain."

"Two what have gone where?" demanded Id-Wan, glowering at him.

"Two dynamic sparks."

"Are you certain?" Without waiting for a reply, Id-Wan ran to the receivers.

It was true enough. Six globes still held their tiny lights. Two were dull, devoid of any gleam. Even as he watched, another became extinguished. Then, in rapid succession, three more.

The chief of the scouts came in saying: "What's the matter? Is there something wrong?"

Slowly, almost ponderously, Id-Wan said "Six scouts have surrendered life in the last few moments." He breathed heavily, seemed to have trouble in accepting the evidence of the globes. "These instruments say they are dead, and if indeed they are dead they cannot retain shape. Their bodies automatically will revert to the form of their fathers. And you know that means—"

"A complete giveaway," said the chief of the scouts, staring grimly at the globes.

Both remaining lights went out.

"Action stations!" yelled Id-Wan, electrified by the sight. "Close all ports! Trim the tubes! Prepare for take-off!" He turned savagely upon Po-Duk. "You're the pilot. Don't squat there gaping like an ebelmint halfway out of its egg! Get into the control seat, idiot—we've no time to lose!"

Something whisked overhead. He caught a fleeting glimpse of it through the nearest observation port. Something long, shapely and glistening, but much too fast to examine. It had gone almost before it registered. Seconds later its noise followed a terrible howl.

The radio technician said: "Powerful signals nearby. Their sources seem to be—"

The ship's tubes coughed, spluttered, shot fire, coughed again. A

tree began to burn. Id-Wan danced with impatience. He dashed to the control room.

"Blast, Po-Duk, blast!"

"There is not yet enough lift, captain, and until the meters show that—"

"Look!" screamed Bi-Nak, pointing for the last time.

They could see what was coming through the facing port; seven ultra-rapid dots in V-formation. The dots lengthened, sprouted wings, swept immediately overhead without a sound. Black lumps fell from their bellies, came down, struck the ship and all around the ship.

The badly lagging noise of the planes never got that far. Their leading waves were repulsed by the awful blast of the bombs.

For the final change, the Rigelians became a cloud of scattered molecules.

Settling himself more comfortably in the chair, the roving video reporter griped, "I'd no sooner shown my face in the office than the area supervisor grabbed me, told me to chase up here and give the breathless world a candid close-up of mad Martians on the rampage. I'm partway here when the Air Force chips in, holds me back a couple of hours. When I do get here what do I find?" He sniffed sourly. "Some timber smoking around a whacking big crater. Nothing else. Not a pretzel."

Dragging an almost endless handkerchief from his pocket, Kampenfeldt smeared it across his brow: "We keep civilization at arm's length here. We've no radio, no video. So I don't know what you're talking about."

"It's like this," explained the reporter, "they dumped their spies in the parks during the night. They weren't around long because they got picked up with the milk. Twenty steps and Clancy had 'em."

"Eh?"

"The cops," elucidated the other. "We put the faces of the first pair on the breakfast-time videocast. Ten people phoned through in a hurry and identified them as Johnson and Greer. So we assumed that said Johnson and Greer were nuts." He gave a lugubrious laugh.

"Sometimes I've thought so myself," Kampenfeldt offered.

"Then, half an hour later, the next station on the chain infringed our copyright by also showing Johnson and Greer. Another followed suit ten minutes later still. By ten o'clock there were four pairs of them, as alike as two of you, and all grabbed in similiar circumstances. It looked like the whole cockeyed world wanted to be Johnson or, alternatively, Greer."

"Not me," denied Kampenfeldt. "Neither of them."

"The news value of that was, of course, way up. We planted the entire eight of them on the mid-morning boost which is nation-wide, our

only thought being that we'd got something mighty queer. Military intelligence boys in Washington saw the videocast, pestered local cops for details, put two and two together and made it four, if not eight."

"And then?"

"They clamped heavy pressure on all these Johnsons and Greers. They talked all right, but nothing they said made sense. Eventually one of them tried a fast out, got killed on the run. He was still Johnson when he flopped, but a couple of minutes later his body turned to something else, something right out of this world. Boy, it would have turned your stomach!"

"In that case, I want no description," said Kampenfeldt, defensively nursing his outsize paunch.

"That was an eye-opener. Anything not of this world obviously must be of some other. The authorities bore down on the remaining seven who acted as before until they realized that we knew what we knew. Forthwith they put death before dishonor, leaving us with eight dollops of goo and no details."

"Ugh!" said Kampenfeldt, hitching his paunch.

"Our only clue lay in Johnson and Greer. Since these creatures had copied real people, the thing to do was find the last known whereabouts of said people. Chances were good that alien invaders would be found in that vicinity. A shout went up for Johnson and Greer. Fifty friends of theirs put them here, right here. The forest rangers chipped in saying you'd just reported them missing."

"I did," admitted Kampenfeldt. "And if I'd known where they'd gone, I'd be missing myself—and still running."

"Well, the Air Force took over. They were told to look-see. If an alien ship was down, it was to stay down. You know those boys. They swoop around yipping. They overdid the job, left not a sliver of metal as big as my finger. So what do I put on the videocast? Just a crater and some smoking tree stumps."

"Which is no great pity," opined Kampenfeldt. "Who wants to see things that could climb into your bed as Uncle Willie? You wouldn't know who was who with creatures like that around."

"You would not." The reporter pondered awhile, added, "Their simulation was perfect. They had the power to lead us right up the garden path if only they'd known how to use it. Power is never much good unless you know how to use it. They made a first-class blunder when they grabbed their models." He scratched his head, eyed the other speculatively. "It sure beats me that of all places in this wide world they had to pick on a nudist camp."

"Solar health center." corrected Kampenfeldt, primly.

THE END.

BOOK REVIEWS

"First Lensman," by Edward E. Smith, Ph.D. Fantasy Press, Reading, Pa. 1950. 306 p. Ill. $3.00

Here is the long-awaited, completely new Smith yarn which ties "Triplanetary" into the "Lensman" series and reveals Virgil Samms as the first of the line of super-beings made immortal by the immortal Doc. For good measure we have Virgil's high-powered daughter Jill, not one but two Kinnisons, and a grand assortment of hard characters, black and white, carrying out the galactic chess-play of Arisia and Eddore. You visit the bizarre world of Trenco and encounter the four-dimensional dexitroboppers and emmfozers of Palain Seven. You have two super-shemozzles of men and fleets, assassination at the Ambassadors' Ball, disaster in the uranium mines of Eridan, and as all-out a political fracas as science fiction has seen, with the Galactic Patrol at stake. Old-timers may feel that by bringing Arisia and Eddore into the open Doc Smith is throwing away some of the mystery and suspense of the original versions, but that's a matter of taste. It's all there, folks—it's all there!

P. Schuyler Miller

"The Conquest Of Space"*

Reviewed by R. S. Richardson

I can still remember as clearly as if it were yesterday the first time an astronomy book fell into my hands. This milestone in my scientific career occurred when I was in the sixth grade of the only grammar school in Los Altos, California. The school had a small library which the pupils were allowed to use consisting principally of such old favorites as "Freckles," "The Five Little Peppers And How They Grew," "Hans Brinker And The Silver Skates," et cetera. There was only one book in the collection, however, which I deemed worthy of my attention—a slim little volume by Sir Robert Ball

*THE CONQUEST OF SPACE by Chesley Bonestell and Willy Ley. The Viking Press, New York. 1949. 160 pages (includes forty-eight pages of illustrations, sixteen in full color). $3.95.

entitled "In Starry Realms," or something of the sort. The notable features about this book, which has kept it so fresh in my memory, were the colored paintings of the moon and planets. They fascinated me. To think that this was the way Jupiter and Saturn really looked when you saw them at some great observatory like the one on Mount Hamilton, visible occasionally from near the schoolyard.

What my sensations would have been if I could have journeyed forward to 1949 for a peek at an astronomy book such as "The Conquest Of Space" is hard to say. Probably I should have tried to bring it back to those pre-war days in Los Altos in somewhat the same way that Wells' Time Traveler brought back some flowers from the world of A.D. 802, 701.

The first chapter opens with a description of the launching of a rocket from the White Sands Proving Grounds followed by some remarks on rocket flight and space travel in general. The reader is then taken on a tour of the solar system with special stops at our nearest neighbors, Moon, Venus, and Mars. Mr. Ley shows nice judgment in inserting just the right amount of technical material to give the book stability without making it burdensome. The factual material is lightened by numerous interesting and amusing historical anecdotes some of which may be unfamiliar even to professional astronomers. The whole is written in a conversational style that carries the reader along so easily that at the end he will be surprised at the amount of astronomy he has assimilated without going through any conscious learning process.

How the Viking Press managed to publish a book 8 X 11 inches, with sixteen illustrations in full color and thirty-two in half tone for only $3.95, is a mystery to me. It is my experience that publishers begin to pull up the drawbridge and call out the guard at the slightest mention of color plates. Readers will recognize certain of the paintings which appeared originally in Astounding SCIENCE FICTION and *Air Trails*.

An artist who desires to paint astronomical scenes must have certain unique qualifications in addition to the necessary technical skill. We assume as a matter of course that he can visualize the complicated relations among the celestial bodies. Then he certainly must have genuine enthusiasm for his subject. How many of the old masters who were so good on fat nudes and windmills could have painted a convincing picture of a spaceship diving into Copernicus? Finally, the artist must be able to portray an astronomical scene both with photographic realism as well as imagination. That is, the painting should give the impression that it was snapped on the spot, yet it should not be *quite* photographic. It should have a certain unreal dreamlike quality that hints of the awful desolation of the planets.

A fine example is the picture on

page 132 of Saturn at the crescent phase seen from Titan, in my opinion the best thing Bonestell has done. In the foreground two barren peaks of the satellite rise from a snowfield which extends far beyond them into the distance. Saturn and its ring are thin ghosts low on the horizon. We cannot help wondering what is the significance of these great masses revolving ceaselessly through space. It seems incredible that life can exist on their frozen surface. Were they then created to serve no other purpose than to provide a few terrestrial mathematicians with an intricate problem in celestial mechanics? We wonder if men will ever find the answer among those lonely mountain peaks on Titan.

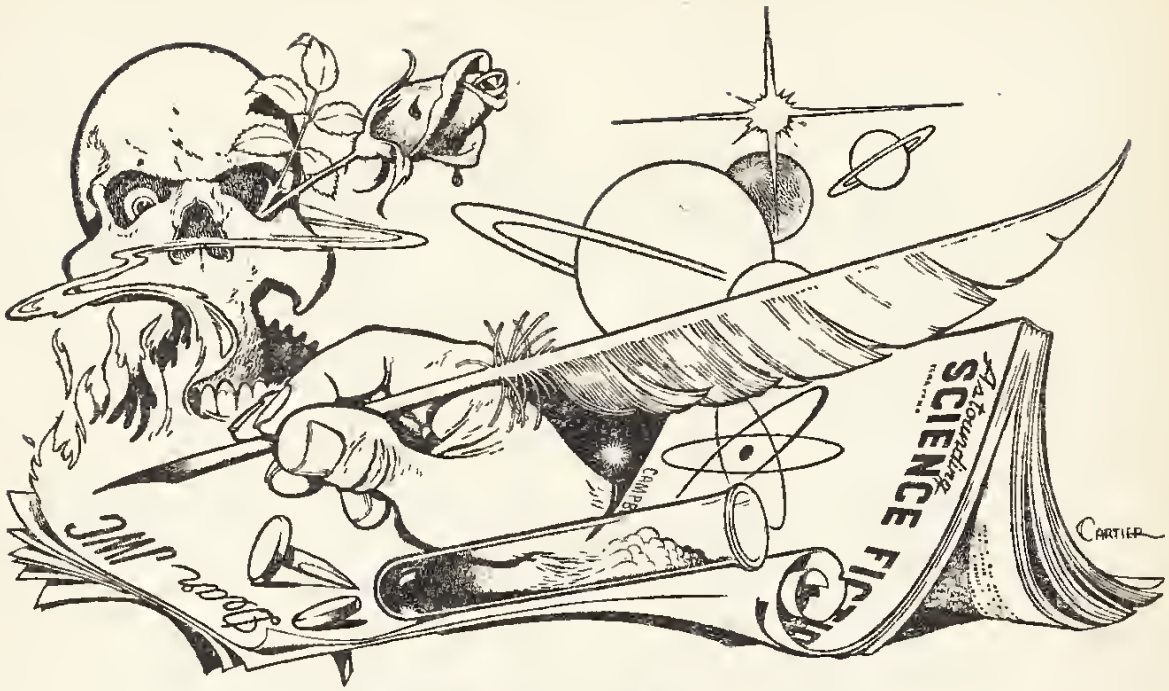
Mr. Bonestell says he has been interested in astronomy since the age of ten. After studying architecture at Columbia, he was employed both as designer and renderer on most of the big skyscrapers in New York. (A "renderer" in case you don't know is the man who changes the design sketches for a building into a picture to show to the cash customers.) When the depression halted construction in 1932, Bonestell came to the west coast, where he eventually worked into the special camera effects department of a motion picture studio. Here he discovered that his ability to depict objects with startling realism was much in demand. "All my life I had been fighting the 'tight' technique and trying to paint broadly. Now I found that the photographic technique was hard to find and valuable, so I went all out for it ever since."

As I read the manuscript in proof I am necessarily compelled to vouch for the accuracy of the text, although I cannot guarantee that some errors may not have escaped me. The statement that the total range in temperamost six hundred degrees Fahrenture on the moon "amounts to alheit" would seem to be stretching it a bit. The extreme range measured by Nicholson and Pettit was 516° F. The main uncertainty is in the temperature of the dark side. It is extremely difficult to measure the heat radiation from a body at less than −279° F (100° K). Their measured temperature of the dark side came out 120°K, not much above this value.

Some readers will probably question certain statements that are not established facts but matters of opinion; for example, the origin of the lunar craters is not nearly as well settled as the remarks on pages 68 and 69 would imply. Doubtless the solution of many such problems will have to wait until they can be studied at first hand.

The expression "out of this world" has been so badly overworked that one hesitates to use it again. But here the temptation is altogether too strong. "The Conquest Of Space" is really out of this world.

THE END



BRASS TACKS

Dear Mr. Campbell:

We find, after reading your article, "Digital Computer," that we disagree with your estimate of the required efficiency and speed of search for data stored in the mind. Our disagreements arise as a consequence of the following arguments.

While recognizing that we do not know the method of search actually employed by the mind, the simple method of general classification into large groups subdivided into smaller groups et cetera, will yield the observed short search time. On the basis of such a system any datum to be recognized will be automatically classified as a member of a relatively small group. For example, let us consider the number, 13.6, mentioned in your editorial. 13.6 immediately is restricted to lie in that division containing exact numerical data. Typical members of the group will be the numerical values of e, h, c, averages, conversion factors, dates, distance, et cetera. But certainly not non-numerical items. We feel that this division will probably not contain more than two hundred distinct items, unless the individual has a remarkable memory or is engaged in work which requires a large store of numerical data, in which case it could be of the order of one thousand. Therefore, it would seem that on the basis of this type of organization the search time could be fairly short and the sampling rate quite low because the search would be restricted to so few items.

Further, we feel that the number, 10^{21}, it not typical of the total number of items to be searched. If we

were to accumulate items to be retained in the memory at the phenomenal rate of one per second, there would only be 2.10^9 items at the end of sixty years. Now, what might seem to be a single item could conceivably involve several thousand punched molecules. However, these come up as a group and therefore do not have to be extracted individually. Therefore, we feel that 2.10^9 represents a generous upper bound on the number of items which would be searched even if there were no classifications introduced.

We should further like to point out that the memory process discussed in "Digital Computer," namely that of search through the memory files for the desired data, contains the implicit assumption that the data remains passive during the search. It would seem entirely possible that it may be the datum which actively makes itself known when the general desire for that datum is broadcast. We do not seriously propose this process because of our meager knowledge of the subject, but it seems of interest to point out the possibility of a different mechanism which would give extremely rapid extraction of data from the memory. —Eugene N. Parker, and George S. Kenny, California Institute of Technology, Pasadena, California.

I think you grossly underrate your own minds. I doubt that any physicist could function effectively with as few as 1000 numerical data. How many data-units would be needed to store present knowledge of the atomic types? How many spectrum lines does the spectroscopist know by number?

Dear Mr. Campbell:

Since the majority of your readers like to use their egos I've dug up an old puzzler that checks but doesn't give you the correct logic. Common sense tells you what the answer should be, but it always comes out the same way and that way is always —wrong! Here goes: Three men who are stopping at a rather crowded and somewhat expensive hotel inquire about the rates, since they wish to pay the hotel clerk in advance. The clerk tells them that the room they have is thirty dollars. They pay him ten dollars each.

After the men are upstairs in their room, the clerk discovers that he has overcharged them a total of five dollars since they get a reduction for the sharing of the room. He sends the bellboy upstairs with the money five minutes later.

The bellboy goes up to the room and gives the gentlemen three dollars, since he is dishonest, and keeps two dollars for himself. Now let's add: Since the gentlemen each got one dollar back from the money they paid the clerk, it means that they have now paid nine dollars each, or twenty-seven dollars totally for their room. The bellboy kept two dollars for himself. Twenty-seven and two equals twenty-nine. Where did the other dollar go?

Now let's check: The men paid the clerk thirty dollars. The clerk gave five dollars to the bellboy to bring back to the men. That leaves the clerk with twenty-five dollars. The men each got back one dollar, and the bellboy kept two dollars. Twenty-five plus two plus three—one from each man—equals thirty!

If any reader finds where the other dollar went to, I personally guarantee him a year's subscription to Astounding Science Fiction! How's that?—Ronald Friedman, 1980 East 8th Street, Brooklyn 23, New York.

It makes sense with ordinals instead of cardinals!

Dear Mr. Campbell:

In the January Brass Tacks, Robert L. Smith—NO RELATION—argues that the Air Force would offer a better basis than the Navy for a Space Force, because:

"The Navy traditionally steers its course in a two-dimensional plane, while the Air Force, by its very nature must constantly operate in a three-dimensional plane."

But this is hardly the most important factor in determining who is fit for deep space. The Air Force specializes in short sorties—seventy-two hours at most—while the Navy's personnel are accustomed to being self-sufficient for months, and for years if necessary.

And in view of the probable cramped condition of space travel, wouldn't the ideal rocket crew be found among the men of the Submarine Service?

Which Service, by the way, operates in three dimensions.—Hugh J. Smith, 154 Monitor Street, Brooklyn 22, New York.

The three-dimensional, long-cruise, sealed-ship service: submariners!

Dear Mr. Campbell:

I should like to have the use of a few lines of Brass Tacks for an announcement of some interest and, I hope, importance to at least a portion of your readers.

The Eighth World Science-Fiction Convention—the NORWESCON—is to be held here in Portland on September 1, 2, 3, and 4, of this fall; that is, over the Labor Day week end. It is too early yet to make definite statements as to program, speakers, et cetera. Suffice it to say that this is an unexampled opportunity for the renewal of old acquaintance and the formation of new among science-fiction fans from all over the nation, and indeed from outside it too. A number of well-known authors and other figures of fandom will be on hand, also.

We of the convention committee most earnestly desire to hear from any and all interested who have not yet been contacted. Membership in the NORWESCON may be obtained by sending one dollar to: NORWESCON, Box 8517, Portland 7, Oregon.

For those fans who have attended one of these get-togethers,

no more need be said. For those who have not, you owe yourselves this opportunity to meet your counterparts the world over. And for those who have never been to the Pacific Northwest—and we are assured they are legion—this is a real chance you can't afford to miss, to kill the proverbial two birds with one stone.

See you at the NORWESCON! —Monna May Sheller, Box 8517, Portland 7, Oregon.

No massive accomplishments result from such conferences—but you'll have a lot of fun if you can make it!

Dear Mr. Campbell:

The '50 issue of Astounding SCIENCE FICTION was one of your better ones. I have been reading ASF for only about a half year, but, I consider this particular issue as fine.

To begin with, the cover by Rogers was colorful and well-done, to say the least. He seems to be my top artist. This brings to mind another of your artists: Cartier. He seems to be stuck with only a short story every time. Why not have him do a serial or two? It would be appreciated by many.

Oh, yes, serials! "To the Stars," by L. Ron Hubbard, rates a good first place. This Hubbard always seems to come up with a new idea. I like his writing style; it is superb.

The rest of the stories were well strung out behind the Hubbard serial. If I must pick a second choice, it would go to "Regulations Provide," by Raymond F. Jones. "New Foundations," by Shiras and "The Mercenaries," by Piper, each are about third, while "Conformity Expected" by somebody called Fyfe is a below normal fourth.

By the way, why not try excluding your monthly article and insert another piece of fiction instead. Many ASFans would agree with me, I think. I have never read an article, and I don't think that they would be interesting enough. I know it would be a drastic change and most of your fans would resent it, but nevertheless it would be a much needed change.—Francis M. Mulford, 512 Linwood Avenue, Buffalo 9, New York.

The articles serve a dual—or triple purpose. They acquaint our readers with new factors of science. They give the authors new leads. They also help the reader to know the author's suggestions are based on facts, not just fantasy!

Dear Mr. Campbell:

Things are looking up, serial-wise, in THE magazine. First, Asimov with a terrific new maturity as a writer. ". . . And Now You Don't" is one of the best pieces of *writing* I have ever run across. The guy has really learned to write a story with perfect integration of ALL the elements; there is none of van Vogt's necessity of introducing a mysterious, unseen entity whose main reason for existence is to solve the

problems the writer can't solve within his story framework. Incidentally, with regard to the typical vV ending: I don't think it's fair to the reader. There should be some reason for the story to connect up as a unit, and the reason should be apparent all along the way—in the second reading!

The other serial that has sent me into raptures is, of course, "To The Stars". The story intrigues me. For the Anlab, give it a one double-plus!

Now that I'm started, let's see if I can finish the Anlab report in short order. Number Two: "The Mercenaries". Too bad, from an Anlab viewpoint, that it was in the same issue as the ending of a fine serial; otherwise it would have rated a big, fat One. But when there are two—or three, or four—stories of really outstanding character in one issue, it's a blamed good sign. When the best magazine in a field begins printing stories that are even better than its usual ones, it can only mean that the entire field is entering a new era. With stf, it is an indication of the fact that the public may finally be accepting the entire genre. After all, once an H-bomb is discussed on every street corner, who can say what is pure imagination and what is scientific probability?

Number Three: "New Foundations". It seems that this group of stories about the Wonder Children is really a full length novel, fed to us section by section. Until I saw this latest story, I was convinced that Shiras couldn't do it—that the nature of the first story made it impossible for him to maintain quality in later ones; I thought that the series would bog down of its own weight. Luckily, he hasn't let down much; injection of new ideas keeps the story, as a whole, quite interesting.

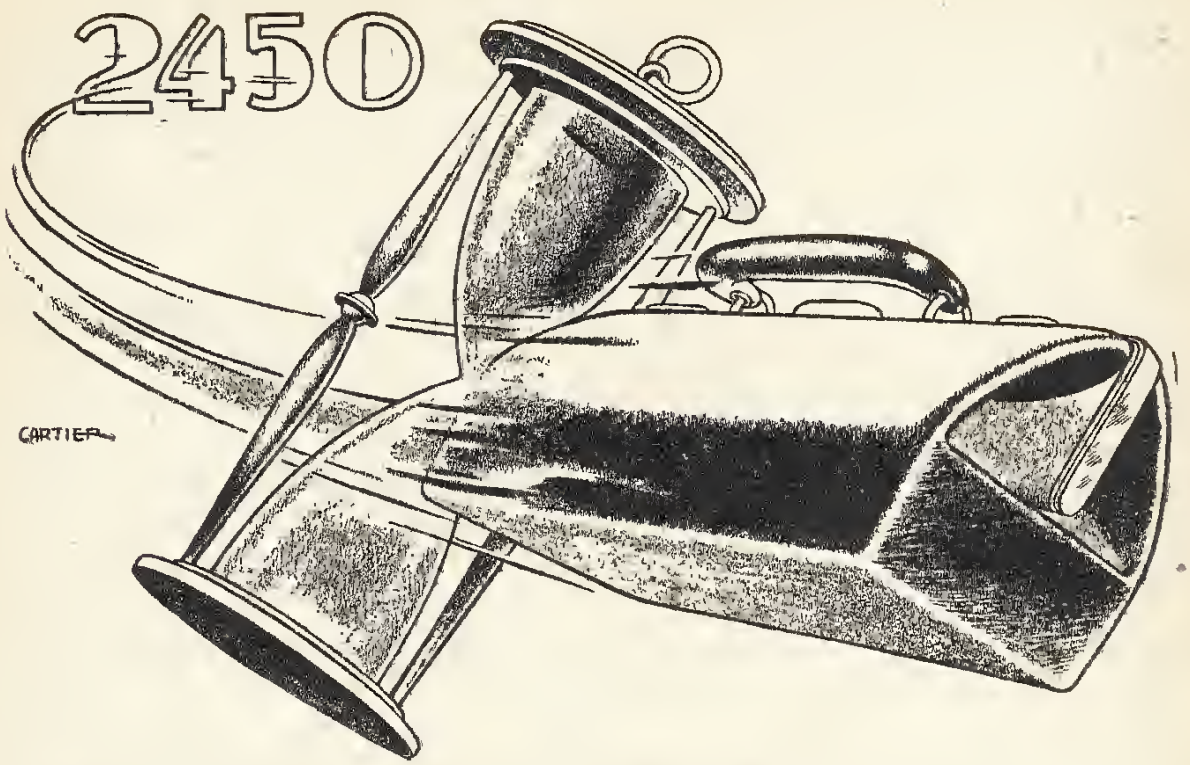
Number Four: "Conformity Expected".

Number Five: "Regulations Provide". Regulations provide that letters, to be printable, must not contain an excess of profanity; I'll conform. But it seems that writers encounter the same problems as the rest of us, since so many of them have come forth with complaints against red tape. The trouble is, after a few doses of complaint, the idea gets a bit worn through, to say the least!

In Times To Come, can you give us a Timmins cover sometime soon? I'm interested in seeing how he'll work in his name, next time. The cover he did for "Dreadful Sanctuary" was the most obvious, with a "secret" letter to JWC, Jr. Maybe the next one will have a "Timmins Street" or "WT Restaurant". Anyhow, I like his work on covers, and can't see how anybody could do without Cartier on interior pics.

To add the regular ending to a Brass Tacks letter, please PLEASE PLEASE revive *Unknown!*—Mike Salovesh, 1005 East 60th, Chicago 37, Ill.

Maybe regulations are old hat—but I liked "Joe's Service & Repair"!



THE LITTLE BLACK BAG

BY C. M. KORNBLUTH

The normal progress of a technology produces simpler and simpler gadgets involving more and more complex fundamental laws. And, of course, requiring less and less of the user . . .

Illustrated by Cartier

Old Dr. Full felt the winter in his bones as he limped down the alley. It was the alley and the back door he had chosen rather than the sidewalk and the front door because of the brown paper bag under his arm. He knew perfectly well that the flat-faced, stringy-haired women of his street and their gap-toothed, sour-smelling husbands did not notice if he brought a bottle of cheap wine to his room. They all but lived on the stuff themselves, varied by whiskey when pay checks were boosted by overtime. But Dr. Full, unlike them, was ashamed.

A complicated disaster occurred as he limped down the littered alley. One of the neighborhood dogs—a mean little black one he knew and hated, with its teeth always bared and always snarling with menace—hurled at his legs through a hole in the board fence that lined his path. Dr. Full flinched, then swung his leg in what was to have been a satisfying kick to the animal's gaunt ribs. But the winter in his bones weighed down the leg. His foot failed to clear a half-buried brick, and he sat down abruptly, cursing. When he smelled unbottled wine and realized his brown paper package had slipped from under his arm and smashed, his curses died on his lips. The snarling black dog was circling him at a yard's distance, tensely stalking, but he ignored it in the greater disaster.

With stiff fingers as he sat in the filth of the alley, Dr. Full unfolded the brown paper bag's top, which had been crimped over, grocer-wise. The early autumnal dusk had come; he could not see plainly what was left. He lifted out the jug-handled top of his half gallon, and some fragments, and then the bottom of the bottle. Dr. Full was far too occupied to exult as he noted that there was a good pint left. He had a problem, and emotions could be deferred until the fitting time.

The dog closed in, its snarl rising in pitch. He set down the bottom of the bottle and pelted the dog with the curved triangular glass fragments of its top. One of them connected, and the dog ducked back through the fence, howling. Dr. Full then placed a razorlike edge of the half-gallon bottle's foundation to his lips and drank from it as though it were a giant's cup. Twice he had to put it down to rest his arms, but in one minute he had swallowed the pint of wine.

He thought of rising to his feet and walking through the alley to his room, but a flood of well-being drowned the notion. It was, after all, inexpressibly pleasant to sit there and feel the frost-hardened mud of the alley turn soft, or seem to, and to feel the winter evaporating from his bones under a warmth which spread from his stomach through his limbs.

A three-year-old girl in a cut-down winter coat squeezed through the same hole in the board fence from which the black dog had sprung its ambush. Gravely she toddled up to Dr. Full and inspected him, with her dirty forefinger in her mouth. Dr. Full's happiness had been providentially made complete; he had been supplied with an audience.

"Ah, my dear," he said hoarsely. And then: "Preposserous accuzation. 'If that's what you call evidence,' I should have told them, 'you better stick to your doctoring.' I should have told them: 'I was here before your County Medical Society. And the License Commissioner never proved a thing on me. So, gennulmen, doesn't it stand to reason? I appeal to you as fellow memmers of a great profession—' "

The little girl, bored, moved away,

picking up one of the triangular pieces of glass to play with as she left. Dr. Full forgot her immediately, and continued to himself earnestly: "But so help me, they *couldn't* prove a thing. Hasn't a man got any *rights?*" He brooded over the question, of whose answer he was so sure, but on which the Committee on Ethics of the County Medical Society had been equally certain. The winter was creeping into his bones again, and he had no money and no more wine.

Dr. Full pretended to himself that there was a bottle of whiskey somewhere in the fearful litter of his room. It was an old and cruel trick he played on himself when he simply had to be galvanized into getting up and going home. He might freeze there in the alley. In his room he would be bitten by bugs and would cough at the moldy reek from his sink, but he would not freeze and be cheated of the hundreds of bottles of wine that he still might drink, the thousands of hours of glowing content he still might feel. He thought about that bottle of whiskey—was it back of a mounded heap of medical journals? No; he had looked there last time. Was it under the sink, shoved well to the rear, behind the rusty drain? The cruel trick began to play itself out again. Yes, he told himself with mounting excitement, yes, it might be! Your memory isn't so good nowadays, he told himself with rueful good-fellowship. You know perfectly well you might have bought a bottle of whiskey and shoved it behind the sink drain for a moment just like this.

The amber bottle, the crisp snap of the sealing as he cut it, the pleasurable exertion of starting the screw cap on its threads, and then the refreshing tangs in his throat, the warmth in his stomach, the dark, dull happy oblivion of drunkenness —they became real to him. You *could* have, you know! You *could* have! he told himself. With the blessed conviction growing in his mind—It *could* have happened, you know! It *could* have!—he struggled to his right knee. As he did, he heard a yelp behind him, and curiously craned his neck around while resting. It was the little girl, who had cut her hand quite badly on her toy, the piece of glass. Dr. Full could see the rilling bright blood down her coat, pooling at her feet.

He almost felt inclined to defer the image of the amber bottle for her, but not seriously. He knew that it was there, shoved well to the rear under the sink, behind the rusty drain where he had hidden it. He would have a drink and then magnanimously return to help the child. Dr. Full got to his other knee and then his feet, and proceeded at a rapid totter down the littered alley toward his room, where he would hunt with calm optimism at first for the bottle that was not there, then with anxiety, and then with frantic violence. He would hurl books and dishes about before he was done looking for the amber bottle of whiskey, and finally would beat his

swollen knuckles against the brick wall until old scars on them opened and his thick old blood oozed over his hands. Last of all, he would sit down somewhere on the floor, whimpering, and would plunge into the abyss of purgulent nightmare that was his sleep.

After twenty generations of shilly-shallying and "we'll cross that bridge when we come to it", genus homo had bred himself into an impasse. Dogged biometricians had pointed out with irrefutable logic that mental subnormals were outbreeding mental normals and supernormals, and that the process was occurring on an exponential curve. Every fact that could be mustered in the argument proved the biometricians' case, and led inevitably to the conclusion that genus homo was going to wind up in a preposterous jam quite soon. If you think that had any effect on breeding practices, you do not know genus homo.

There was, of course, a sort of masking effect produced by that other exponential function, the accumulation of technological devices. A moron trained to punch an adding machine seems to be a more skillful computer than a medieval mathematician trained to count on his fingers. A moron trained to operate the twenty-first century equivalent of a linotype seems to be a better typographer than a Renaissance printer limited to a few fonts of movable type. This is also true of medical practice.

It was a complicated affair of many factors. The supernormals "improved the product" at greater speed than the subnormals degraded it, but in smaller quantity because elaborate training of their children was practiced on a custom-made basis. The fetish of higher education had some weird avatars by the twentieth generation: "colleges" where not a member of the student body could read words of three syllables; "universities" where such degrees as "Bachelor of Typewriting," "Master of Shorthand" and "Doctor of Philosophy (Card Filing)" were conferred, with the traditional pomp. The handful of supernormals used such devices in order that the vast majority might keep some semblance of a social order going.

Some day the supernormals would mercilessly cross the bridge; at the twentieth generation they were standing irresolutely at its approaches wondering what had hit them. And the ghosts of twenty generations of biometricians chuckled malignantly.

It is a certain Doctor of Medicine of this twentieth generation that we are concerned with. His name was Hemingway—John Hemingway, B. Sc., M. D. He was a general practitioner, and did not hold with running to specialists with every trifling ailment. He often said as much, in approximately these words: "Now, uh, what I mean is you got a good old G.P. See what I mean? Well, uh, now a good old G.P. don't claim

he knows all about lungs and glands and them things, get me? But you got a G.P., you got, uh, you got a, well, you got a . . . *all-around man!* That's what you got when you got a G.P.—you got a all-around man."

But from this, do not imagine that Dr. Hemingway was a poor doctor. He could remove tonsils or appendixes, assist at practically any confinement and deliver a living, uninjured infant, correctly diagnose hundreds of ailments and prescribe and administer the correct medication or treatment for each. There was, in fact, only one thing he could not do in the medical line, and that was, violate the ancient canons of medical ethics. And Dr. Hemingway knew better than to try.

Dr. Hemingway and a few friends were chatting one evening when the event occurred that precipitates him into our story. He had been through a hard day at the clinic, and he wished his physicist friend Walter Gillis, B. Sc., M. Sc., Ph. D., would shut up so he could tell everybody about it. But Gillis kept rambling on, in his stilted fashion: "You got to hand it to old Mike; he don't have what we call the scientific method, but you got to hand it to him. There this poor little dope is, puttering around with some glassware and I come up and I ask him, kidding of course, 'How's about a time-travel machine, Mike?' "

Dr. Gillis was not aware of it, but "Mike" had an I.Q. six times his own, and was—to be blunt—his keeper. "Mike" rode herd on the pseudo-physicists in the pseudo-laboratory, in the guise of a bottle-washer. It was a social waste—but as has been mentioned before, the supernormals were still standing at the approaches to a bridge. Their irresolution led to many such preposterous situations. And it happens that "Mike," having grown frantically bored with his task, was malevolent enough to—but let Dr. Gillis tell it:

"So he gives me these here tube numbers and says, 'Series circuit. Now stop bothering me. Build your time machine, sit down at it and turn on the switch. That's all I ask, Dr. Gillis—that's all I ask.' "

"Say," marveled a brittle and lovely blond guest, "you remember real good, don't you, doc?" She gave him a melting smile.

"Heck," said Gillis modestly, "I always remember good. It's what you call an inherent facility. And besides I told it quick to my secretary, so she wrote it down. I don't read so good, but I sure remember good, all right. Now, where was I?"

Everybody thought hard, and there were various suggestions:

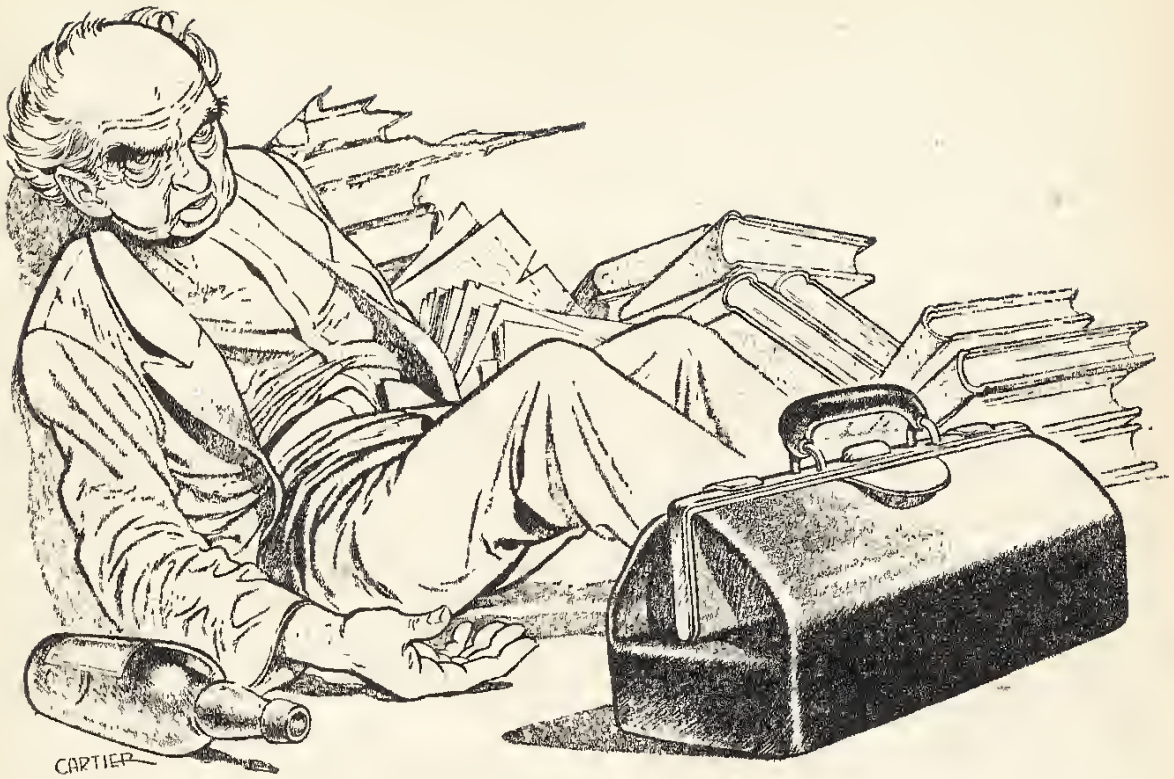
"Something about bottles, doc?"

"You was starting a fight. You said 'time somebody was traveling.' "

"Yeah—you called somebody a swish. Who did you call a swish?"

"Not swish—*switch.*"

Dr. Gillis' noble brow grooved with thought, and he declared: "Switch is right. It was about time travel. What we call travel through time. So I took the tube number he



gave me and I put them into the circuit-builder, I set it for 'series' and there it is—my time-traveling machine. It travels things through time real good." He displayed a box.

"What's in the box?" asked the lovely blonde.

Dr. Hemingway told her: "Time travel. It travels things through time."

"Look," said Gillis, the physicist. He took Dr. Hemingway's little black bag and put it on the box. He turned on the switch and the little black bag vanished.

"Say," said Dr. Hemingway, "that was, uh, swell. Now bring it back."

"Huh?"

"Bring back my little black bag."

"Well," said Dr. Gillis, "they don't come back. I tried it backwards and they don't come back. I guess maybe that dummy Mike give me a bum steer."

There was wholesale condemnation of "Mike" but Dr. Hemingway took no part in it. He was nagged by a vague feeling that there was something he would have to do. He reasoned: "I am a doctor, and a doctor has got to have a little black bag. I ain't got a little black bag—so ain't I a doctor no more?" He decided that this was absurd. He *knew* he was a doctor. So it must be the bag's fault for not being there. It was no good, and he would get another one tomorrow from that dummy Al, at the clinic. Al could find things good, but he was a dummy—never liked to talk sociable to you.

So the next day Dr. Hemingway remembered to get another little black bag from his keeper—another little black bag with which he could perform tonsilectomies, appendectomies and the most difficult confinements, and with which he could diagnose and cure his kind until the day when the supernormals could bring themselves to cross that bridge. Al was kinda nasty about the missing little black bag, but Dr. Hemingway didn't exactly remember what had happened, so no tracer was sent out, so—

Old Dr. Full awoke from the horrors of the night to the horrors of the day. His gummy eyelashes pulled apart convulsively. He was propped against a corner of his room, and something was making a little drumming noise. He felt very cold and cramped. As his eyes focused on his lower body, he croaked out a laugh. The drumming noise was being made by his left heel, agitated by fine tremors against the bare floor. It was going to be the D.T.'s again, he decided dispassionately. He wiped his mouth with his bloody knuckles, and the fine tremor coarsened; the snare-drum beat became louder and slower. He was getting a break this fine morning, he decided sardonically. You didn't get the horrors until you had been tightened like a violin string, just to the breaking point. He had a reprieve, if a reprieve into his old body with the blazing, endless headache just back of the eyes and the screaming stiffness in the joints were anything to be thankful for.

There was something or other about a kid, he thought vaguely. He was going to doctor some kid. His eyes rested on a little black bag in the center of the room, and he forgot about the kid. "I could have sworn," said Dr. Full, "I hocked that two years ago!" He hitched over and reached the bag, and then realized it was some stranger's kit, arriving here he did not know how. He tentatively touched the lock and it snapped open and lay flat, rows and rows of instruments and medications tucked into loops in its four walls. It seemed vastly larger open than closed. He didn't see how it could possibly fold up into that compact size again, but decided it was some stunt of the instrument makers. Since his time—that made it worth more at the hock shop, he thought with satisfaction.

Just for old times' sake, he let his eyes and fingers rove over the instruments before he snapped the bag shut and headed for Uncle's. More than a few were a little hard to recognize—exactly that. You could see the things with blades for cutting, the forceps for holding and pulling, the retractors for holding fast, the needles and gut for suturing, the hypos—a fleeting thought crossed his mind that he could peddle the hypos separately to drug addicts.

Let's go, he decided, and tried to fold up the case. It didn't fold until he happened to touch the lock, and

then it folded all at once into a little black bag. Sure have forged ahead, he thought, almost able to forget that what he was primarily interested in was its pawn value.

With a definite objective, it was not too hard for him to get to his feet. He decided to go down the front steps, out the front door and down the sidewalk. But first—

He snapped the bag open again on his kitchen table, and pored through the medication tubes. "Anything to sock the autonomic nervous system good and hard," he mumbled. The tubes were numbered, and there was a plastic card which seemed to list them. The left margin of the card was a run-down of the sytsems—vascular, muscular, nervous. He followed the last entry across to the right. There were columns for "stimulant," "depressant," and so on. Under "nervous system" and "depressant" he found the number 17, and shakily located the little glass tube which bore it. It was full of pretty blue pills and he took one.

It was like being struck by a thunderbolt.

Dr. Full had so long lacked any sense of well-being except the brief glow of alcohol that he had forgotten its very nature. He was panic-stricken for a long moment at the sensation that spread through him slowly, finally tingling in his fingertips. He straightened up, his pains gone and his leg tremor stilled.

That was great, he thought. He'd be able to *run* to the hock shop, pawn the little black bag and get some booze. He started down the stairs. Not even the street, bright with mid-morning sun, into which he emerged made him quail. The little black bag in his left hand had a satisfying, authoritative weight. He was walking erect, he noted, and not in the somewhat furtive crouch that had grown on him in recent years. A little self-respect, he told himself, that's what I need. Just because a man's down doesn't mean—

"Docta, please-a come wit'!" somebody yelled at him, tugging his arm. "Da litt-la girl, she's-a burn' up!" It was one of the slum's innumerable flat-faced, stringy-haired women, in a slovenly wrapper.

"Ah, I happen to be retired from practice—" he began hoarsely, but she would not be put off.

"In by here, Docta!" she urged, tugging him to a doorway. "You come look-a da litt-la girl. I got two dolla, you come look!" That put a different complexion on the matter. He allowed himself to be towed through the doorway into a mussy, cabbage-smelling flat. He knew the woman now, or rather knew who she must be—a new arrival who had moved in the other night. These people moved at night, in motorcades of battered cars supplied by friends and relations, with furniture lashed to the tops, swearing and drinking until the small hours. It explained why she had stopped him: she did not yet know he was old Dr. Full, a drunken reprobate whom nobody would trust. The little black bag had been his guarantee, out-

weighing his whiskery face and stained black suit.

He was looking down on a three-year-old girl who had, he rather suspected, just been placed in the mathematical center of a freshly-changed double bed. God knew what sour and dirty mattress she usually slept on. He seemed to recognize her as he noted a crusted bandage on her right hand. Two dollars, he thought— An ugly flush had spread up her pipe-stem arm. He poked a finger into the socket of her elbow, and felt little spheres like marbles under the skin and ligaments roll apart. The child began to squall thinly; beside him, the woman gasped and began to weep herself.

"Out," he gestured briskly at her, and she thudded away, still sobbing.

Two dollars, he thought— Give her some mumbo jumbo, take the money and tell her to go to a clinic. Strep, I guess, from that stinking alley. It's a wonder any of them grow up. He put down the little black bag and forgetfully fumbled for his key, then remembered and touched the lock. It flew open, and he selected a bandage shears, with a blunt wafer for the lower jaw. He fitted the lower jaw under the bandage, trying not to hurt the kid by its pressure on the infection, and began to cut. It was amazing how easily and swiftly the shining shears snipped through the crusty rag around the wound. He hardly seemed to be driving the shears with fingers at all. It almost seemed as though the shears were driving his fingers instead as they scissored a clean, light line through the bandage.

Certainly have forged ahead since my time, he thought—sharper than a microtome knife. He replaced the shears in their loop on the extraordinarily big board that the little black bag turned into when it unfolded, and leaned over the wound. He whistled at the ugly gash, and the violent infection which had taken immediate root in the sickly child's thin body. Now what can you do with a thing like that? He pawed over the contents of the little black bag, nervously. If he lanced it and let some of the pus out, the old woman would think he'd done something for her and he'd get the two dollars. But at the clinic they'd want to know who did it and if they got sore enough they might send a cop around. Maybe there was something in the kit—

He ran down the left edge of the card to "lymphatic" and read across to the column under "infection." It didn't sound right at all to him; he checked again, but it still said that. In the square to which the line and column led were the symbols: "IV-g-3cc". He couldn't find any bottles marked with Roman numerals, and then noticed that that was how the hypodermic needles were designated. He lifted number IV from its loop, noting that it was fitted with a needle already and even seemed to be charged. What a way to carry those things around! So—

three c.c.'s of whatever was in hypo number IV ought to do something or other about infections settled in the lymphatic system—which, God knows, this one was. What did the lower-case "g" mean, though? He studied the glass hypo and saw letters engraved on what looked like a rotating disk at the top of the barrel. They ran from "a" to "i", and there was an index line engraved on the barrel on the opposite side from the calibrations.

Shrugging, old Dr. Full turned the disk until "g" coincided with the index line, and lifted the hypo to eye level. As he pressed in the plunger he did not see the tiny thread of fluid squirt from the tip of the needle. There was a sort of dark mist for a moment about the tip. A closer inspection showed that the needle was not even pierced at the tip. It had the usual slanting cut across the bias of the shaft, but the cut did not expose an oval hole. Baffled, he tried pressing the plunger again. Again *something* appeared around the tip and vanished. "We'll settle this," said the doctor. He slipped the needle into the skin of his forearm. He thought at first that he had missed—that the point had glided over the top of his skin instead of catching and slipping under it. But he saw a tiny blood-spot and realized that somehow he just hadn't felt the puncture. Whatever was in the barrel, he decided, couldn't do him any harm if it lived up to his billing—and if it could come out through a needle that had no hole. He gave himself three c.c. and twitched the needle out. There was the swelling—painless, but otherwise typical.

Dr. Full decided it was his eyes or something, and gave three c.c. of "g" from hypodermic IV to the feverish child. There was no interruption to her wailing as the needle went in and the swelling rose. But a long instant later, she gave a final gasp and was silent.

Well, he told himself, cold with horror, you did it that time. You killed her with that stuff.

Then the child sat up and said: "Where's my mommy?"

Incredulously, the doctor seized her arm and palpated the elbow. The gland infection was zero, and the temperature seemed normal. The blood-congested tissues surrounding the wound were subsiding as he watched. The child's pulse was stronger and no faster than a child's should be. In the sudden silence of the room he could hear the little girl's mother sobbing in her kitchen, outside. And he also heard a girl's insinuating voice:

"She gonna be O.K., doc?"

He turned and saw a gaunt-faced, dirty-blond sloven of perhaps eighteen leaning in the doorway and eying him with amused contempt. She continued: "I heard about you, *Doc-tor* Full. So don't go try and put the bite on the old lady. You couldn't doctor up a sick cat."

"Indeed?" he rumbled. This young person was going to get a lesson she richly deserved. "Perhaps

you would care to look at my patient?"

"Where's my mommy?" insisted the little girl, and the blonde's jaw fell. She went to the bed and cautiously asked: "You O.K. now, Teresa? You all fixed up?"

"Where's my mommy?" demanded Teresa. Then, accusingly, she gestured with her wounded hand at the doctor. "You *poke* me!" she complained, and giggled pointlessly.

"Well—" said the blond girl, "I guess I got to hand it to you, doc. These loud-mouth women around here said you didn't know your . . . I mean, didn't know how to cure people. They said you ain't a real doctor."

"I *have* retired from practice," he said. "But I happened to be taking this case to a colleague as a favor, your good mother noticed me, and —" a deprecating smile. He touched the lock of the case and it folded up into the little black bag again.

"You stole it," the girl said flatly.

He sputtered.

"Nobody'd trust you with a thing like that. It must be worth plenty. You stole that case. I was going to stop you when I come in and saw you working over Teresa, but it looked like you wasn't doing her any harm. But when you give me that line about taking that case to a colleague I know you stole it. You gimme a cut or I go to the cops. A thing like that must be worth twenty-thirty dollars."

The mother came timidly in, her eyes red. But she let out a whoop of joy when she saw the little girl sitting up and babbling to herself,

embraced her madly, fell on her knees for a quick prayer, hopped up to kiss the doctor's hand, and then dragged him into the kitchen, all the while rattling in her native language while the blond girl let her eyes go cold with disgust. Dr. Full allowed himself to be towed into the kitchen, but flatly declined a cup of coffee and a plate of anise cakes and St. John's Bread.

"Try him on some wine, ma," said the girl sardonically.

"Hyass! Hyass!" breathed the woman delightedly. "You like-a wine, docta?" She had a carafe of purplish liquid before him in an instant, and the blond girl snickered as the doctor's hand twitched out at it. He drew his hand back, while there grew in his head the old image of how it would smell and then taste and then warm his stomach and limbs. He made the kind of calculation at which he was practiced; the delighted woman would not notice as he downed two tumblers, and he could overawe her through two tumblers more with his tale of Teresa's narrow brush with the Destroying Angel, and then—why, then it would not matter. He would be drunk.

But for the first time in years, there was a sort of counter-image: a blend of the rage he felt at the blond girl to whom he was so transparent, and of pride at the cure he had just effected. Much to his own surprise, he drew back his hand from the carafe and said, luxuriating in the words: "No, thank you. I don't believe I'd care for any so early in the day." He covertly watched the blond girl's face, and was gratified at her surprise. Then the mother was shyly handing him two bills and saying: "Is no much-a money, docta—but you come again, see Teresa?"

"I shall be glad to follow the case through," he said. "But now excuse me—I really must be running along." He grasped the little black bag firmly and got up; he wanted very much to get away from the wine and the older girl.

"Wait up, doc," said she, "I'm going your way." She followed him out and down the street. He ignored her until he felt her hand on the black bag. Then old Dr. Full stopped and tried to reason with her:

"Look, my dear. Perhaps you're right. I might have stolen it. To be perfectly frank, I don't remember how I got it. But you're young and you can earn your own money—"

"Fifty-fifty," she said, "or I go to the cops. And if I get another word outta you, it's sixty-forty. And you know who gets the short end, don't you, doc?"

Defeated, he marched to the pawnshop, her impudent hand still on the handle with his, and her heels beating out a tattoo against his stately tread.

In the pawnshop, they both got a shock.

"It ain't stendard," said Uncle, unimpressed by the ingenious lock. "I ain't nevva seen one like it. Some cheap Jap stuff, maybe? Try down the street. This I nevva could sell."

Down the street they got an offer of one dollar. The same complaint was made: "I ain't a collecta, mista—I buy stuff that got resale value. Who could I sell this to, a Chinaman who don't know medical instruments? Every one of them looks funny. You sure you didn't make these yourself?" They didn't take the one-dollar offer.

The girl was baffled and angry; the doctor was baffled too, but triumphant. He had two dollars, and the girl had a half-interest in something nobody wanted. But, he suddenly marveled, the thing had been all right to cure the kid, hadn't it?

"Well," he asked her, "do you give up? As you see, the kit is practically valueless."

She was thinking hard. "Don't fly off the handle, doc. I don't get this but something's going on all right . . . would those guys know good stuff if they saw it?"

"They would. They make a living from it. Wherever this kit came from—"

She seized on that, with a devilish faculty she seemed to have of eliciting answers without asking questions. "I thought so. You don't know either, huh? Well, maybe I can find out for you. C'mon in here. I ain't letting go of that thing. There's money in it—some way, I don't know how, there's money in it." He followed her into a cafeteria and to an almost-empty corner. She was oblivious to stares and snickers from the other customers as she opened the little black bag—it almost covered a cafeteria table—and ferreted through it. She picked out a retractor from a loop, scrutinized it, contemptuously threw it down, picked out a speculum, threw it down, picked out the lower half of an O.B. forceps, turned it over, close to her sharp young eyes—and saw what the doctor's dim old ones could not have seen.

All old Dr. Full knew was that she was peering at the neck of the forceps and then turned white. Very carefully, she placed the half of the forceps back in its loop of cloth and then replaced the retractor and the speculum. "Well?" he asked. "What did you see?"

" 'Made in U.S.A.,' " she quoted hoarsely. " 'Patent Applied for July 2450.' "

He wanted to tell her she must have misread the inscription, that it must be a practical joke, that—

But he knew she had read correctly. Those bandage shears: they *had* driven his fingers, rather than his fingers driving them. The hypo needle that had no hole. The pretty blue pill that had struck him like a thunderbolt.

"You know what I'm going to do?" asked the girl, with sudden animation. "I'm going to go to charm school. You'll like that, won't ya, doc? Because we're sure going to be seeing a lot of each other."

Old Dr. Full didn't answer. His hands had been playing idly with that plastic card from the kit on which had been printed the rows and columns that had guided him twice be-

fore. The card had a slight convexity; you could snap the convexity back and forth from one side to the other. He noted, in a daze, that with each snap a different text appeared on the cards. *Snap.* "The knife with the blue dot in the handle is for tumors only. Diagnose tumors with your Instrument Seven, the Swelling Tester. Place the Swelling Tester—" *Snap.* "An overdose of the pink pills in Bottle 3 can be fixed with one white pill from Bottle—" *Snap.* "Hold the suture needle by the end without the hole in it. Touch it to one end of the wound you want to close and let go. After it has made the knot, touch it—" *Snap.* "Place the top half of the O.B. Forceps near the opening. Let go. After it has entered and conformed to the shape of—" *Snap.*

The slot man saw "FLANNERY 1—MEDICAL" in the upper left corner of the hunk of copy. He automatically scribbled "trim to .75" on it and skimmed it across the horseshoe-shaped copy desk to Piper, who had been handling Edna Flannery's quack-exposé series. She was a nice youngster, he thought, but like all youngsters she over-wrote. Hence, the *"trim."*

Piper dealt back a city hall story to the slot, pinned down Flannery's feature with one hand and began to tap his pencil across it, one tap to a word, at the same steady beat as a teletype carriage traveling across the roller. He wasn't exactly reading it this first time. He was just looking at the letters and words to find out whether, as letters and words, they conformed to *Herald* style. The steady tap of his pencil ceased at intervals as it drew a black line ending with a stylized letter "d" through the word "breast" and scribbled in "chest" instead, or knocked down the capital "E" in "East" to lower case with a diagonal, or closed up a split word—in whose middle Flannery had bumped the space bar of her typewriter—with two curved lines like parentheses rotated through ninety degrees. The thick black pencil zipped a ring around the "30" which, like all youngsters, she put at the end of her stories. He turned back to the first page for the second reading. This time, the pencil drew lines with the stylized "d's" at the end of them through adjectives and whole phrases, printed big "L's" to mark paragraphs, hooked some of Flannery's own paragraphs together with swooping recurved lines.

At the bottom of "FLANNERY ADD 2—MEDICAL" the pencil slowed down and stopped. The slot man, sensitive to the rhythm of his beloved copy desk, looked up almost at once. He saw Piper squinting at the story, at a loss. Without wasting words, the copy reader skimmed it back across the Masonite horseshoe to the chief, caught a police story in return and buckled down, his pencil tapping. The slot man read as far as the fourth add, barked at Howard, on the rim: "Sit in for me," and stumped through the clattering city room toward the alcove

where the managing editor presided over his own bedlam.

The copy chief waited his turn while the make-up editor, the press-room foreman and the chief photographer had words with the M. E. When his turn came, he dropped Flannery's copy on his desk and said: "She says this one isn't a quack."

The M. E. read:

"FLANNERY 1 — MEDICAL, by Edna Flannery, *Herald* Staff Writer.

"The sordid tale of medical quackery which the *Herald* has exposed in this series of articles undergoes a change of pace today which the reporter found a welcome surprise. Her quest for the facts in the case of today's subject started just the same way that her exposure of one dozen shyster M.D.'s and faith-healing phonies did. But she can report for a change that Dr. Bayard Kendrick Full is, despite unorthodox practices which have drawn the suspicion of the rightly hypersensitive medical associations, a true healer living up to the highest ideals of his profession.

"Dr. Full's name was given to the *Herald's* reporter by the ethical committee of a county medical association, which reported that he had been expelled from the association on July 18, 1941 for allegedly 'milking' several patients suffering from trivial complaints. According to sworn statements in the committee's files, Dr. Full had told them they suffered from cancer, and that he had a treatment which would prolong their lives. After his expulsion from the association, Dr. Full dropped out of their sight—until he opened a midtown 'sanitarium' in a brownstone front which had for years served as a rooming house.

"The *Herald's* reporter went to that sanitarium, on East 89th Street, with the full expectation of having numerous imaginary ailments diagnosed and of being promised a sure cure for a flat sum of money. She expected to find unkempt quarters, dirty instruments and the mumbo-jumbo paraphernalia of the shyster M. D. which she had seen a dozen times before.

"She was wrong.

"Dr. Full's sanitarium is spotlessly clean, from its tastefully-furnished entrance hall to its shining, white treatment rooms. The attractive, blond receptionist who greeted the reporter was soft-spoken and correct, asking only the reporter's name, address and the general nature of her complaint. This was given, as usual, as 'nagging backache.' The receptionist asked the *Herald's* reporter to be seated, and a short while later conducted her to a second-floor treatment room and introduced her to Dr. Full.

"Dr. Full's alleged past, as described by the medical society spokesman, is hard to reconcile with his present appearance. He is a clear-eyed, white-haired man in his sixties, to judge by his appearance—a little above middle height and apparently in good physical condition. His voice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was firm and friendly, untainted by the ingratiating whine of the shyster M. D. which the reporter has come to know too well.

"The receptionist did not leave the room as he began his examination after a few questions as to the nature and location of the pain. As the reporter lay face down on a treatment table the doctor pressed some instrument to the small of her back. In about one mintue he made this astounding statement: "Young woman, there is no reason for you to have any pain where you say you do. I understand they're saying nowadays that emotional upsets cause pains like that. You'd better go to a psychologist or psychiatrist if the pain keeps up. There is no physical cause for it, so I can do nothing for you.'

"His frankness took the reporter's breath away. Had he guessed she was, so to speak, a spy in his camp? She tried again: 'Well, doctor, perhaps you'd give me a physical checkup. I feel run-down all the time, besides the pains. Maybe I need a tonic.' This is never-failing bait to shyster M. D.'s—an invitation for them to find all sorts of mysterious conditions wrong with a patient, each of which 'requires' an expensive treatment. As explained in the first article of this series, of course, the reporter underwent a thorough physical checkup before she embarked on her quack-hunt, and was found to be in one hundred percent perfect condition, with the exception of a 'scarred' area at the bottom tip of her left lung resulting from a childhood attack of tuberculosis and a tendency toward 'hyperthyroidism'—overactivity of the thyroid gland which makes it difficult to put on weight and sometimes causes a slight shortness of breath.

"Dr. Full consented to perform the examination, and took a number of shining, spotlessly-clean instruments from loops in a large board literally covered with instruments—most of them unfamiliar to the reporter. The instrument with which he approached first was a tube with a curved dial in its surface and two wires that ended on flat disks growing from its ends. He placed one of the disks on the back of the reporter's right hand and the other on the back of her left. 'Reading the meter,' he called out some number which the attentive receptionist took down on a ruled form. The same procedure was repeated several times, thoroughly covering the reporter's anatomy and thoroughly convincing her that the doctor was a complete quack. The reporter had never seen any such diagnostic procedure practiced during the weeks she put in preparing for this series.

"The doctor then took the ruled sheet from the receptionist, conferred with her in low tones and said: 'You have a slightly overactive thyroid, young woman. And there's something wrong with your left lung—not seriously, but I'd like to take a closer look.'

"He selected an instrument from

the board which, the reporter knew, is called a 'speculum'—a scissorlike device which spreads apart body openings such as the orifice of the ear, the nostril and so on, so that a doctor can look in during an examination. The instrument was, however, too large to be an aural or nasal speculum but too small to be anything else. As the *Herald's* reporter was about to ask further questions, the attending receptionist told her: 'It's customary for us to blindfold our patients during lung examinations—do you mind?' The reporter, bewildered, allowed her to tie a spotlessly-clean bandage over her eyes, and waited nervously for what would come next.

"She still cannot say exactly what happened while she was blindfolded—but X rays confirm her suspicions. She felt a cold sensation at her ribs on the left side—a cold that seemed to enter inside her body. Then there was a snapping feeling, and the cold sensation was gone. She heard Dr. Full say in a matter-of-fact voice: 'You have an old tubercular scar down there. It isn't doing any particular harm, but an active person like you needs all the oxygen she can get. Lie still and I'll fix it for you.'

"Then there was a repetition of the cold sensation, lasting for a longer time. 'Another batch of alveoli and some more vascular glue,' the *Herald's* reporter heard Dr. Full say, and the receptionist's crisp response to the order. Then the strange sensation departed and the eye-bandage was removed. The reporter saw no scar on her ribs, and yet the doctor assured her: 'That did it. We took out the fibrosis—and a good fibrosis it was, too; it walled off the infection so you're still alive to tell the tale. Then we planted a few clumps of alveoli—they're the little gadgets that get the oxygen from the air you breathe into your blood. I won't monkey with your thyroxin supply. You've got used to being the kind of person you are, and if you suddenly found yourself easy-going and all the rest of it, chances are you'd only be upset. About the backache: just check with the county medical society for the name of a good psychologist or psychiatrist. And look out for quacks; the woods are full of them.'

"The doctor's self-assurance took the reporter's breath away. She asked what the charge would be, and was told to pay the receptionist fifty dollars. As usual, the reporter delayed paying until she got a receipt signed by the doctor himself, detailing the services for which it paid. Unlike most, the doctor cheerfully wrote: 'For removal of fibrosis from left lung and restoration of alveoli,' and signed it.

"The reporter's first move when she left the sanitarium was to head for the chest specialist who had examined her in preparation for this series. A comparison of X rays taken on the day of the 'operation' and those taken previously would, the *Herald's* reporter then thought, expose Dr. Full as a prince of shyster

M. D.'s and quacks.

"The chest specialist made time on his crowded schedule for the reporter, in whose series he has shown a lively interest from the planning stage on. He laughed uproariously in his staid Park Avenue examining room as she described the weird procedure to which she had been subjected. But he did not laugh when he took a chest X ray of the reporter, developed it, dried it and compared it with the ones he had taken earlier. The chest specialist took six more X rays that afternoon, but finally admitted that they all told the same story. The *Herald's* reporter has it on his authority that the scar she had eighteen days ago from her tuberculosis is now gone and has been replaced by healthy lung-tissue. He declares that this is a happening unparalleled in medical history. He does not go along with the reporter in her firm conviction that Dr. Full is responsible for the change.

"The *Herald's* reporter, however, sees no two ways about it. She concludes that Dr. Bayard Kendrick Full—whatever his alleged past may have been—is now an unorthodox but highly successful practitioner of medicine, to whose hands the reporter would trust herself in any emergency.

"Not so is the case of 'Rev.' Annie Dimsworth—a female harpy who, under the guise of 'faith' preys on the ignorant and suffering who come to her sordid 'healing parlor' for help and remain to feed 'Rev.' Annie's bank account, which now totals up to $53,238.64. Tomorrow's article will show, with photostats of bank statements and sworn testimony that—"

The managing editor turned down "FLANNERY LAST ADD—MEDICAL" and tapped his front teeth with a pencil, trying to think straight. He finally told the copy chief: "Kill the story. Run the teaser as a box." He tore off the last paragraph—the "teaser" about "Rev." Annie—and handed it to the desk man, who stumped back to his Masonite horseshoe.

The make-up editor was back, dancing with impatience as he tried to catch the M. E.'s eye. The interphone buzzed with the red light which indicated that the editor and publisher wanted to talk to him. The M. E. thought briefly of a special series on this Dr. Full, decided nobody would believe it and that he probably was a phony anyway. He spiked the story on the "dead" hook and answered his interphone.

Dr. Full had become almost fond of Angie. As his practice had grown to engross the neighborhood illnesses, and then to a corner suite in an uptown taxpayer building, and finally to the sanitarium, she seemed to have grown with it. Oh, he thought, we have our little disputes—

The girl, for instance, was too much interested in money. She had wanted to specialize in cosmetic surgery—removing wrinkles from wealthy old women and what-not. She didn't realize, at first, that a

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thing like this was in their trust, that they were the stewards and not the owners of the little black bag and its fabulous contents.

He had tried, ever so cautiously, to analyze them, but without success. All the instruments were slightly radioactive, for instance, but not quite so. They would make a Geiger-Mueller counter indicate, but they would not collapse the leaves of an electroscope. He didn't pretend to be up on the latest developments, but as he understood it, that was just plain *wrong*. Under the highest magnification, there were lines on the instruments' super-finished surfaces: incredibly fine lines, engraved in random hatchments which made no particular sense. Their magnetic properties were preposterous. Sometimes the instruments were strongly attracted to magnets, sometimes less so, and sometimes not at all.

Dr. Full had taken X rays in fear and trembling lest he disrupt whatever delicate machinery worked in them. He was *sure* they were not solid, that the handles and perhaps the blades must be mere shells filled with busy little watch-works—but the X rays showed nothing of the sort. Oh, yes—and they were always sterile, and they wouldn't rust. Dust *fell* off them if you shook them: now, that was something he understood. They ionized the dust, or were ionized themselves, or something of the sort. At any rate, he had read of something similar that had to do with phonograph records.

She wouldn't know about that, he proudly thought. She kept the books well enough, and perhaps she gave him a useful prod now and then when he was inclined to settle down. The move from the neighborhood slum to the uptown quarters had been her idea, and so had the sanitarium. Good; good; it enlarged his sphere of usefulness. Let the child have her mink coats and her convertible, as they seemed to be calling roadsters nowadays. He himself was too busy and too old. He had so much to make up for.

Dr. Full thought happily of his Master Plan. She would not like it much, but she would have to see the logic of it. This marvelous thing that had happened to them must be handed on. She was herself no doctor; even though the instruments practically ran themselves, there was more to doctoring than skill. There were the ancient canons of the healing art. And so, having seen the logic of it, Angie would yield; she would assent to his turning over the little black bag to all humanity.

He would probably present it to the College of Surgeons, with as little fuss as possible—well, perhaps a *small* ceremony, and he would like a souvenir of the occasion, a cup or a framed testimonial. It would be a relief to have the thing out of his hands, in a way; let the giants of the healing art decide who was to have its benefits. No; Angie would understand. She was a goodhearted girl.

It was nice that she had been showing so much interest in the sur-

gical side lately—asking about the instruments, reading the instruction card for hours, even practicing on guinea pigs. If something of his love for humanity had been communicated to her, old Dr. Full sentimentally thought, his life would not have been in vain. Surely she would realize that a greater good would be served by surrendering the instruments to wiser hands than theirs, and by throwing aside the cloak of secrecy necessary to work on their small scale.

Dr. Full was in the treatment room that had been the brownstone's front parlor; through the window he saw Angie's yellow convertible roll to a stop before the stoop. He liked the way she looked as she climbed the stairs; neat, not flashy, he thought. A sensible girl like her, she'd understand. There was somebody with her—a fat woman, puffing up the steps, overdressed and petulant. Now, what could she want?

Angie let herself in and went into the treatment room, followed by the fat woman. "Doctor," said the blond girl gravely, "may I present Mrs. Coleman?" Charm school had not taught her everything, but Mrs. Coleman, evidently *noveau riche,* thought the doctor, did not notice the blunder.

"Miss Aquella told me *so* much about you, doctor, and your remarkable system!" she gushed.

Before he could answer, Angie smoothly interposed: "Would you excuse us for just a moment, Mrs.

Coleman?"

She took the doctor's arm and led him into the reception hall. "Listen," she said swiftly, "I know this goes against your grain, but I couldn't pass it up. I met this old thing in the exercise class at Elizabeth Barton's. Nobody else'll talk to her there. She's a widow, I guess her husband was a black marketeer or something, and she has a pile of dough. I gave her a line about how you had a system of massaging wrinkles out. My idea is, you blindfold her, cut her neck open with the Cutaneous Series knife, shoot some Firmol into the muscles, spoon out some of that blubber with an Adipose Series curette and spray it all with Skintite. When you take the blindfold off she's got rid of a wrinkle and doesn't know what happened. She'll pay five hundred dollars. Now, don't say 'no,' doc. Just this once, let's do it my way, can't you? I've been working on this deal all along too, haven't I?"

"Oh," said the doctor, "very well." He was going to have to tell her about the Master Plan before long anyway. He would let her have it her way this time.

Back in the treatment room, Mrs. Coleman had been thinking things over. She told the doctor sternly as he entered: "Of course, your system is permanent, isn't it?"

"It is, madam," he said shortly. "Would you please lie down there? Miss Aquella, get a sterile three-inch bandage for Mrs. Coleman's eyes." He turned his back on the fat woman to avoid conversation, and pretended to be adjusting the lights. Angie blindfolded the woman, and the doctor selected the instruments he would need. He handed the blond girl a pair of retractors, and told her: "Just slip the corners of the blades in as I cut—" She gave him an alarmed look, and gestured at the reclining woman. He lowered his voice: "Very well. Slip in the corners and rock them along the incision. I'll tell you when to pull them out."

Dr. Full held the Cutaneous Series knife to his eyes as he adjusted the little slide for 3 cm. depth. He sighed a little as he recalled that its last use had been in the extirpation of an "inoperable" tumor of the throat.

"Very well," he said, bending over the woman. He tried a tentative pass through her tissues. The blade dipped in and flowed through them, like a finger through quicksilver, with no wound left in the wake. Only the retractors could hold the edges of the incision apart.

Mrs. Coeman stirred and jabbered: "Doctor, that felt so peculiar! Are you sure you're rubbing the right way?"

"Quite sure, madam," said the doctor wearily. "Would you please try not to talk during the massage?"

He nodded at Angie, who stood ready with the retractors. The blade sank in to its three centimeters, miraculously cutting only the dead horny tissues of the epidermis and

the live tissue of the dermis, pushing aside mysteriously all major and minor blood vessels and muscular tissue, declining to affect any system or organ except the one it was—tuned to, could you say? The doctor didn't know the answer, but he felt tired and bitter at this prostitution. Angie slipped in the retractor blades and rocked them as he withdrew the knife, then pulled to separate the lips of the incision. It bloodlessly exposed an unhealthy string of muscle, sagging in a dead-looking loop from blue-gray ligaments. The doctor took a hypo, Number IX, pre-set to "g" and raised it to his eye-level. The mist came and went; there probably was no possibility of an embolus with one of these gadgets, but why take chances? He shot one c.c. of "g"—identified as "Firmol" by the card—into the muscle. He and Angie watched as it tightened up against the pharynx.

He took the Adipose Series curette, a small one, and spooned out yellowish tissue, dropping it into the incinerator box, and then nodded to Angie. She eased out the retractors and the gaping incision slipped together into unbroken skin, sagging now. The doctor had the atomizer—dialed to "Skintite"—ready. He sprayed, and the skin shrank up into the new firm throat line.

As he replaced the instruments, Angie removed Mrs. Coleman's bandage and gayly announced: "We're finished! And there's a mir-

ror in the reception hall—"

Mrs. Coleman didn't need to be invited twice. With incredulous fingers she felt her chin, and then dashed for the hall. The doctor grimaced as he heard her yelp of delight, and Angie turned to him with a tight smile. "I'll get the money and get her out," she said. "You won't have to be bothered with her any more."

He was grateful for that much.

She followed Mrs. Coleman into the reception hall, and the doctor dreamed over the case of instruments. A ceremony, certainly—he was *entitled* to one. Not everybody, he thought, would turn such a sure source of money over to the good of humanity. But you reached an age when money mattered less, and when you thought of these things you had done that *might* be open to misunderstanding if, just if, there chanced to be any of that, well, that judgment business. The doctor wasn't a religious man, but you certainly found yourself thinking hard about some things when your time drew near—

Angie was back, with a bit of paper in her hands. "Five hundred dollars," she said matter-of-factly. "And you realize, don't you, that we could go over her an inch at a time—at five hundred dollars an inch?"

"I've been meaning to talk to you about that," he said.

There was bright fear in her eyes, he thought—but why?

"Angie, you've been a good girl and an understanding girl, but we can't keep this up forever, you know."

"Let's talk about it some other time," she said flatly. "I'm tired now."

"No—I really feel we've gone far enough on our own. The instruments—"

"Don't say it, doc!" she hissed. "Don't say it, or you'll be sorry!" In her face there was a look that reminded him of the hollow-eyed, gaunt-faced, dirty-blond creature she had been. From under the charm-school finish there burned the guttersnipe whose infancy had been spent on a sour and filthy mattress, whose childhood had been play in the littered alley and whose adolescence had been the sweatshops and the aimless gatherings at night under the glaring street lamps.

He shook his head to dispel the puzzling notion. "It's this way," he patiently began. "I told you about the family that invented the O.B. forceps and kept them a secret for so many generations, how they could have given them to the world but didn't?"

"They knew what they were doing," said the guttersnipe flatly.

"Well, that's neither here nor there," said the doctor, irritated. "My mind is made up about it. I'm going to turn the instruments over to the College of Surgeons. We have enough money to be comfortable. You can even have the house. I've been thinking of going to a warmer

climate, myself." He felt peeved with her for making the unpleasant scene. He was unprepared for what happened next.

Angie snatched the little black bag and dashed for the door, with panic in her eyes. He scrambled after her, catching her arm, twisting it in a sudden rage. She clawed at his face with her free hand, babbling curses. Somehow, somebody's finger touched the little black bag, and it opened grotesquely into that enormous board, covered with shining instruments, large and small. Half a dozen of them joggled loose and fell to the floor.

"*Now* see what you've done!" roared the doctor, unreasonably. Her hand was still viselike on the handle, but she was standing still, trembling with choked-up rage. The doctor bent stiffly to pick up the fallen instruments. Unreasonable girl! he thought bitterly. Making a scene—

Pain drove in between his shoulderblades and he fell face-down. The light ebbed. "Unreasonable girl!" he tried to croak. And then: "They'll know I tried, anyway—"

Angie looked down on his prone body, with the handle of the Number Six Cautery Series knife protruding from it. "—will cut through all tissues. Use for amputations before you spread on the Re-Gro. Extreme caution should be used in the vicinity of vital organs and major blood ves-

sels or nerve trunks—"

"I didn't mean to do that," said Angie, dully, cold with horror. Now the detective would come, the implacable detective who would reconstruct the crime from the dust in the room. She would run and turn and twist, but the detective would find her out and she would be tried in a courtroom before a judge and jury; the lawyer would make speeches, but the jury would convict her anyway, and the headlines would scream: "BLONDE KILLER GUILTY!" and she'd maybe get the chair, walking down a plain corridor where a beam of sunlight struck through the dusty air, with an iron door at the end of it. Her mink, her convertible, her dresses, the handsome man she was going to meet and marry—

The mist of cinematic cliches cleared, and she knew what she would do next. Quite steadily, she picked the incinerator box from its loop in the board—a metal cube with a different-textured spot on one side. "—to dispose of fibroses or other unwanted matter, simply touch the disk—" You dropped something in and touched the disk. There was a sort of soundless whistle, very powerful and unpleasant if you were too close, and a sort of lightless flash. When you opened the box again, the contents were gone. Angie took another of the Cautery Series knives and went grimly to work. Good thing there wasn't any blood to speak of— She finished the awful task in three hours.

She slept heavily that night, totally exhausted by the wringing emotional demands of the slaying and the subsequent horror. But in the morning, it was as though the doctor had never been there. She ate breakfast, dressed with unusual care —and then undid the unusual care. Nothing out of the ordinary, she told herself. Don't do one thing different from the way you would have done it before. After a day or two, you can phone the cops. Say he walked out spoiling for a drunk, and you're worried. But don't rush it, baby—*don't rush it.*

Mrs. Coleman was due at 10:00 a.m. Angie had counted on being able to talk the doctor into at least one more five-hundred-dollar session. She'd have to do it herself now —but she'd have to start sooner or later.

The woman arrived early. Angie explained smoothly: "The doctor asked me to take care of the massage today. Now that he has the tissue-firming process beginning, it only requires somebody trained in his methods—" As she spoke, her eyes swiveled to the instrument case—open! She cursed herself for the single flaw as the woman followed her gaze and recoiled.

"What are those things?" she demanded. "Are you going to cut me with them? I *thought* there was something fishy—"

"Please, Mrs. Coleman," said Angie, "please, *dear* Mrs. Coleman —you don't understand about the . . . the massage instruments!"

"Massage instruments, my foot!" squabbled the woman shrilly. "That doctor *operated* on me. Why, he might have killed me!"

Angie wordlessly took one of the smaller Cutaneous Series knives and passed it through her forearm. The blade flowed like a finger through quicksilver, leaving no wound in its wake. *That* should convince the old cow!

It didn't convince her, but it did startle her. "What did you do with it? The blade folds up into the handle—that's it!"

"Now look closely, Mrs. Coleman," said Angie, thinking desperately of the five hundred dollars. "Look very closely and you'll see that the, uh, the sub-skin massager simply slips beneath the tissues without doing any harm, tightening and firming the muscles themselves instead of having to work through layers of skin and adipose tissue. It's the secret of the doctor's method. Now, how can outside massage have the effect that we got last night?"

Mrs. Coleman was beginning to calm down. "It *did* work, all right," she admitted, stroking the new line of her neck. But your arm's one thing and my neck's another! Let me see you do that with your neck!"

Angie smiled—

Al returned to the clinic after an excellent lunch that had almost

reconciled him to three more months he would have to spend on duty. And then, he thought, and then a blessed year at the blessedly supernormal South Pole working on his specialty—which happened to be telekinesis exercises for ages three to six. Meanwhile, of course, the world had to go on and of course he had to shoulder his share in the running of it.

Before settling down to desk work he gave a routine glance at the bag board. What he saw made him stiffen with shocked surprise. A red light was on next to one of the numbers—the first since he couldn't think when. He read off the number and murmured: "O.K., 674,101. That fixes *you.*" He put the number on a card sorter and in a moment the record was in his hand. Oh, yes—Hemingway's bag. The big dummy didn't remember how or where he had lost it; none of them ever did. There were hundreds of them floating around.

Al's policy in such cases was to leave the bag turned on. The things practically ran themselves, it was practically impossible to do harm with them, so whoever found a lost one might as well be allowed to use it. You turn it off, you have a social loss—you leave it on, it may do some good. As he understood it, and not very well at that, the stuff wasn't "used up." A temporalist had tried to explain it to him with little success that the prototypes in the transmitter *had been transducted* through a series of point-events of transfinite cardinality. Al had innocently asked whether that meant prototypes had been stretched, so to speak, through all time, and the temporalist had thought he was joking and left in a huff.

"Like to see him do this," thought Al darkly, as he telekinized himself to the combox, after a cautious look to see that there were no medics around. To the box he said: "Police chief," and then to the police chief: "There's been a homicide committed with Medical Instrument Kit 674,101. It was lost some months ago by one of my people, Dr. John Hemingway. He didn't have a clear account of the circumstances."

The police chief groaned and said: "I'll call him in and question him." He was to be astonished by the answers, and was to learn that the homicide was well out of his jurisdiction.

Al stood for a moment at the bag board by the glowing red light that had been sparked into life by a departing vital force giving, as its last act, the warning that Kit 674,101 was in homicidal hands. With a sigh, Al pulled the plug and the light went out.

"Yah," jeered the woman. "You'd fool around with my neck, but you wouldn't risk your own with that thing!"

Angie smiled with serene confidence a smile that was to shock hardened morgue attendants. She set the Cutaneous Series knife to 3 centimeters before drawing it across her

neck. Smiling, knowing the blade would cut only the dead horny tissue of the epidermis and the live tissue of the dermis, mysteriously push aside all major and minor blood vessels and muscular tissue—

Smiling, the knife plunging in and its microtome-sharp metal shearing through major and minor blood vessels and muscular tissue and pharynx, Angie cut her throat.

In the few minutes it took the police, summoned by the shrieking Mrs. Coleman, to arrive, the instruments had become crusted with rust, and the flasks which had held vascular glue and clumps of pink, rubbery alveoli and spare gray cells and coils of receptor nerves held only black slime, and from them when opened gushed the foul gases of decomposition.

THE END

THE ANALYTICAL LABORATORY

As this is written, the first letters on the "Dianetics" article are beginning to arrive. That article, quite evidently, is going to be adequately commented on. Now usually, we get pretty fair numbers of letters commenting on stories—but very little discussion of the articles. Most of my reports on the articles come by way of personal contact. The "Turbulent Atmosphere" article by Willy Ley, ending in the April issue, was commented on favorably by several people—some of the personal contacts being via ham radio. But I'd like some comment on what type of articles, what subjects, et cetera, would be liked.

How about some suggestions in that department?

The score on the April issue follows:

APRIL REPORT

Place	Story	Author	Points
1.	The Wizard of Linn (Pt. I)	A. E. van Vogt	1.71
2.	Okie	James Blish	2.58
3.	The Inspector's Teeth	L. Sprague de Camp	3.06
4.	U-Turn	Duncan H. Munro	3.62
5.	Greed	L. Ron Hubbard	3.71

Incidentally, the price of Hubbard's book on Dianetics was upped from $3.00 to $4.00 by the inclusion of much additional material between the time our article was proofed and the inclusion of the ad. Sorry—the correct price is $4.00. THE EDITOR

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